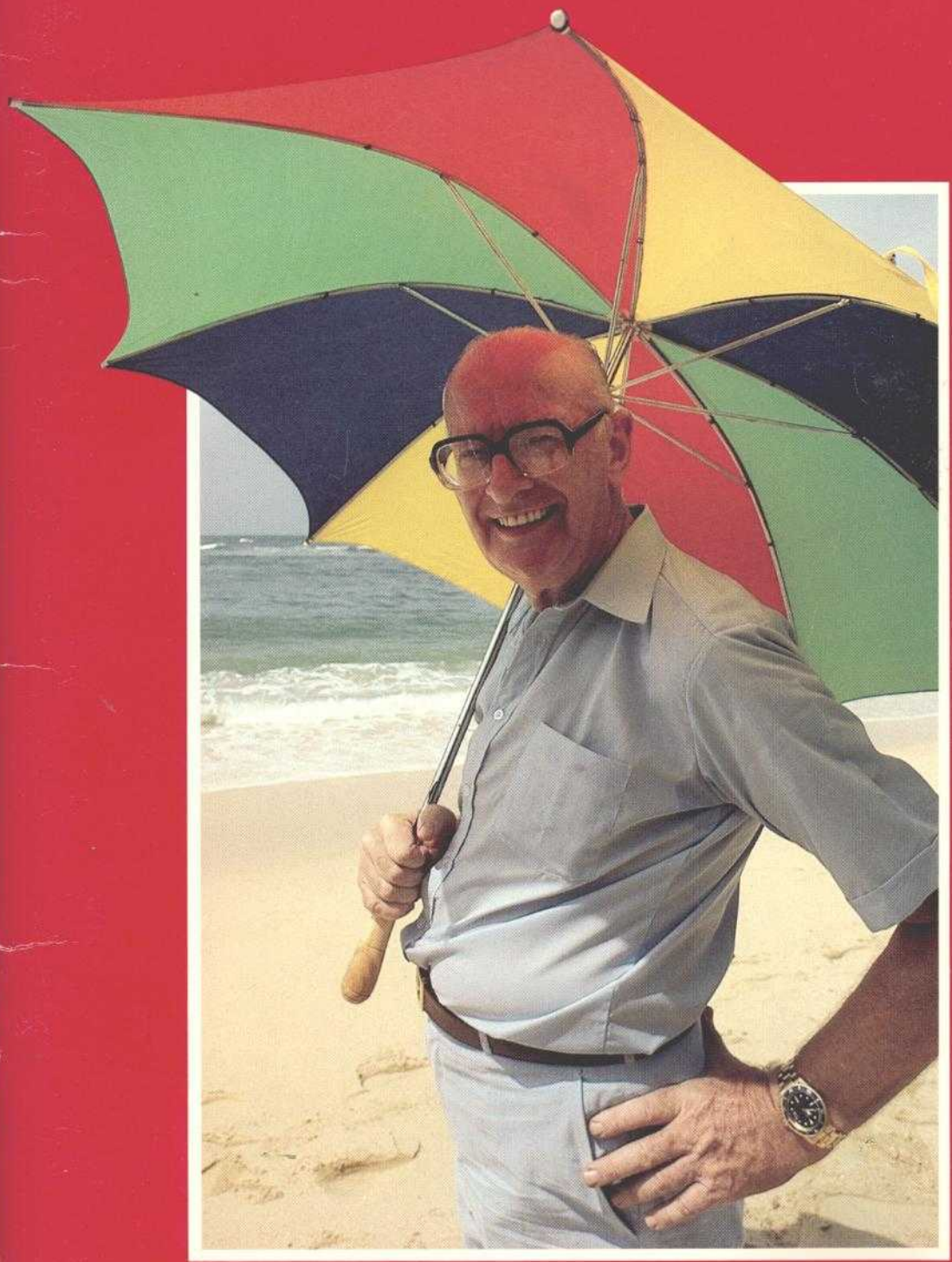
COMSAT

COMMUNICATIONS SATELLITE CORPORATION MAGAZINE

1984



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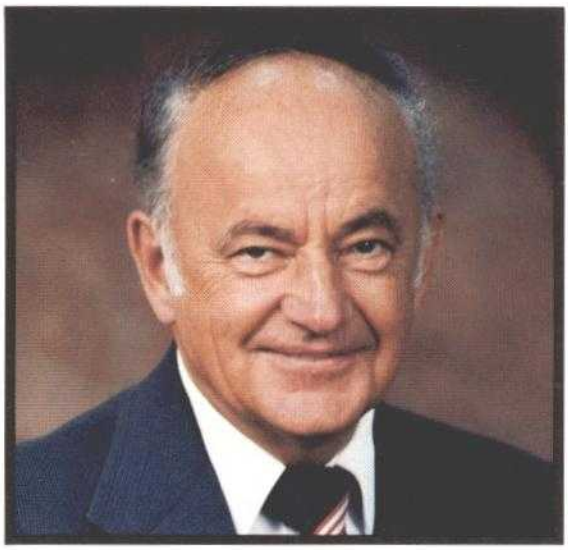
VIEWPOINT



by **Dr. Joseph V. Charyk**
Chairman and Chief Executive Officer
Communications Satellite Corporation

Large potential users of telecommunications services and products, who have held back from committing themselves to advanced systems because of marketplace uncertainties, now have decided to take the plunge. Comsat is reaping the benefits of this new spirit as demand for our newer services and products has increased in recent months.

Space permits me to cite only a small number of the most positive developments. Our satellite systems and communications services subsidiary, Comsat General Corporation, has reached agreement with both governmental and private sector entities that will result in the development of systems that use the new video technology to create private, dedicated networks. For example, Comsat General has now signed a contract with the American Law Institute/American Bar Association under which the videoconferencing center at Comsat Headquarters will be the origination point for an initial network of 40 downlink sites at law facilities around the country.

We are also very pleased that Comsat General will be helping the People's Republic of China and its China Broadcasting Satellite Corporation (CBSC) develop a direct broadcast satellite (DBS) system.

Our equipment manufacturing and systems group, Comsat Technology Products, Inc. (CTP), just recently, entered into a teaming agreement with Mitsubishi Electric Corporation (MELCO) under which both organizations will jointly pursue small aperture Ku-Band earth station business from Federal Express. Amplica, Inc., a part of CTP, has signed a contract with Curtis Mathes of Dallas, Texas, under which Amplica will supply a wholly integrated television receive only system under the Curtis Mathes name, for sale by the Curtis Mathes network of franchised stores. And Comsat TeleSystems, Inc., also a part of CTP, has received substantial new orders for its state-of-the-art Time-Division Multiple-Access systems and has just recently introduced a lightweight ship earth station for use with the Inmarsat system.

In this atmosphere of marketplace optimism, we have decided to take the next big step in our own satellite-to-home or DBS television business, which up until recently we have been pursuing through our subsidiary, Satellite Television Corporation (STC). We have reached a partnership agreement with the Prudential Insurance Company of America, principal investor in United Satellite Communications Inc. (USCI), and Douglas F. Ruhe of Brentwood, Tennessee, a partner in United Press International (UPI). Under terms of this agreement, Comsat will initially own about half of the partnership, which will be capitalized through both equity and debt.

At the same time, we have made the very difficult decision to terminate our participation in Satellite Business Systems (SBS), which we have jointly owned with Aetna Life and Casualty and IBM since 1975. We continue to have the utmost confidence in the future of SBS, but we have decided that given our resources and our other commitments, our withdrawal from the partnership is the right course of action for us.

COMSAT

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Articles in Comsat Magazine reflect the authors' opinions, which may not necessarily be those of Comsat. Permission to reprint articles may be obtained by writing the Editor. Correspondence should be addressed to Stephen A. Saft, Editor, Comsat Magazine, Communications Satellite Corporation, 950 L'Enfant Plaza, S.W., Washington, D.C. 20024.

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Departments

Articles

Cover: Arthur C. Clarke, father of the communications satellite concept, on the beach at Unawatuna, near Weligama, on the southern coast of Sri Lanka. Clarke, who lives year-round in Colombo, Sri Lanka, was filming a segment of new television series "Arthur C. Clarke's World of Strange Powers" with Yorkshire Television" at Unawatuna when captured with umbrella by Chief Photographer William J. Megna. For more on Clarke, see the coverage beginning on page 27.

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From the Editor

It has been two years since we last published a satellite locations guide, and we wish to extend our deepest thanks to three people without whose considerable efforts the eight-page version in the center of the current magazine would not exist.

First, our thanks to Carl H. Schmitt of Comsat General Corporation who provided all the basic information for the guide's table and who then checked, double-checked and triple-checked, not just the table but the chart or map derived from it. Second, our thanks to Shirley T. Cofield, **Comsat Magazine**'s typesetter (as well as our circulation manager) for sticking with the project for a gestation period that lasted over six months. Finally, our thanks to Jim Nuttle of Baskin & Associates, designers of the **Comsat Magazine**, for the overall look of the piece and for performing the extremely taxing job of locating all those satellites on the circles.

For assistance during William J. Megna's stay in Sri Lanka covering Arthur C. Clarke, our thanks to Simon Welfare and Adam Hart-Davis of the English television production company Yorkshire Television of Leeds, England. Yorkshire Television was in Sri Lanka the same time we were to film segments of the new television series *Arthur C. Clarke's World of Strange Powers*. Rohan Ekanayake also provided considerable help to us in Sri Lanka, and in the United States, Arthur Clarke's friends, Frederick and Pip Durant, were of great assistance.

Finally, our thanks to James H. Durham, Director of Engineering Services, Mobile Satellite Systems, Comsat TeleSystems, Inc., for all that he did to make possible photographic coverage of the sea trials of **TeleSystems**' new lightweight down-sized ship earth station.

Stephen A. Saft

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Charyk, Goldstein reelected, Other Annual Meeting news

At the 1984 Annual Meeting of Shareholders in May, 11 members of **Comsat**'s Board of Directors were reelected, and a new member was elected, to terms that expire at the 1985 Annual Meeting. At an organizational meeting of the Board of Directors following the Annual Meeting, Dr. Joseph V. Charyk was reelected Comsat Chairman of the Board and Chief Executive Officer and Irving Goldstein was reelected President.

The 11 reelected Directors are: Joseph V. Charyk, Frederick B. Dent, Elliott M. Estes, Lewis W. Foy, Irving Goldstein, William W. Hagerty, Melvin R. Laird, Ellmore C. Patterson, Charles J. Pilliod, Jr., Bruce G. Sundlun and William L. Zimmer, III. Filling a vacancy on the Board created by the retirement of John D. Harper, the shareholders elected Walter A. Fallon to the Comsat Board. Mr. Fallon was Chairman and Chief Executive Officer of Eastman Kodak Company from January 1977 to May 1983 and currently serves as a director of various business organizations, including Eastman Kodak, Gannett Company, Inc., and General Motors.

In his remarks during the meeting, Dr. Charyk recognized the retirement of John D. Harper, a Comsat director since 1973 who also served as **Comsat**'s Chairman of the Board from May 1979 to May 1983. Commenting on Mr. Harper's retirement, Dr. Charyk said, "During that time, he brought us the benefit of his background of great business experience. The Board of Directors and the Corporation have profited from his wise leadership during his many years of devoted service to the Corporation. He has provided great guidance, advice and support to me personally, and I am deeply grateful to him for this."

Dr. Charyk went on to describe 1983 as "a year of solid performance, in which we posted a 16 percent gain in net income and an 8 percent increase in operating revenues." Commenting on the Corporation's overall business, he added, "During 1983 we continued to draw upon our technical strengths, target our resources on selected market segments and put together a solid management team for the future. As we lay the foundation for continued profitability, we face a number of significant challenges in both our rate-regulated and competitive businesses."

Among the developments Dr. Charyk pointed to were the conclusion of FCC proceedings on the matter of direct access to the Intelsat system and the ongoing partnership discussions between **Comsat** and other potential partners with regard to the formation of a venture to provide direct satellite broadcasting service.

Dr. Charyk also outlined **Comsat**'s financing needs for the future, which he characterized as "substantial." Last year, he said, "we implemented a $125 million commercial paper program and issued $110 million of convertible subordinated debentures." More recently, Dr. Charyk noted, **Comsat** issued an additional $100 million in debentures "to provide funds for the continued growth in our Intelsat and our competitive businesses."

Comsat President Irving Goldstein reviewed **Comsat**'s financial performance, noting that "the first quarter of 1984 was essentially unchanged from that of last year's first quarter." Mr. Goldstein said that 1983 "revenues increased despite a rather significant slowdown in the growth of international telecommunications traffic." In response to that and other market forces, he continued, "**Intelsat** and **Comsat** have implemented new services aimed at addressing the needs of international communications users." Mr. Goldstein also discussed the agreement reached by Comsat General Corporation and NBC last fall, "under which we will provide the satellite distribution system for relaying television programming between NBC and its 180 affiliate stations across the country." The agreement, he added, will generate several hundred million dollars in revenues over its lifetime with possible increases realized through marketing such services as videoconferencing and computer-to-computer communications links.

Mr. Goldstein also reviewed developments related to **Comsat**'s telecommunications equipment manufacturing businesses and the opening of **Comsat**'s newest international earth sta-

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tion, located in Roaring Creek, Pennsylvania. He concluded by noting that "Comsat is positioned well for the future. The outlook for long-term profitability in our operations remains sound."

Comsat, Prudential and Ruhe to be TV venture principals

Preliminary agreements have been reached under which **Comsat**, the Prudential Insurance Company of America and Douglas F. Ruhe of Brentwood, Tennessee, would become the principal general partners in a partnership to provide direct broadcast satellite television services using small receive antennas. The transaction would be subject to the negotiation of a definitive agreement and its final approval by these parties. Under the terms agreed to, **Comsat** would initially own approximately half of the partnership, which would be capitalized through both equity and debt.

The agreements provide that the business of United Satellite Communications Inc. (USCI), in which Prudential has a substantial investment, would be integrated with the business of Satellite Television Corporation (**STC**), a Comsat subsidiary, and both businesses would be conducted by the partnership. Shareholders of USCI, other than Prudential, would also hold minority limited partner interests in the partnership. The new partnership would continue to serve USCI's existing customers, and it contemplates expansion of its services as rapidly as possible. The partnership would use new satellites that are currently under construction by RCA Astro-Electronics for **STC**. In the interim, the partnership would provide a subscription television service making use of an SBS and an Anik satellite. The agreements also provide that ownership of the STC satellites would continue within the Comsat organization, with either their sale or lease to the partnership when the satellites are operational.

Comsat also indicated that work is now going forward on definitive agreements. Additional announcements are expected as developments take place.

Comsat General to help China with direct broadcast system

Comsat General Corporation has signed a consulting contract with the China Broadcasting Satellite Corporation (CBSC) for the People's Republic of China (PRC). Under the contract, **Comsat General** will assist CBSC in its plan to obtain satellite and ground control network equipment for a direct broadcast satellite (DBS) system to distribute television and audio services in the PRC. **Comsat General** will advise CBSC in the preparation of a request for proposal document, assist CBSC in proposal evaluations, and provide consulting support to CBSC during its contract negotiations with the selected suppliers of equipment.

After approval by the Chinese government, CBSC was set up in 1983 under the Ministry of Radio and Television with the express task of establishing and operating a reliable satellite broadcasting system for the distribution of community TV and radio broadcast services. The purpose of the system is to transmit TV programs of the central TV station and radio programs of the Central People's Broadcasting Station of the PRC. CBSC's DBS system will cover the entire country. The goal is to use this advanced technology in educating and encouraging Chinese people to contribute to the PRC's Four Modernizations program.

Comsat General President Robert W. Kinzie, commenting on the CBSC contract, said, "The selection of **Comsat General** to provide technical consulting services by the People's Republic of China is yet another confirmation of the international reputation built by the Corporation. We look forward to working with the Chinese in the development of their domestic DBS system."

One-third interest in SBS to be absorbed by partners

Comsat has reached an agreement in principle for the sale of all of its one-third ownership interest in Satellite Business Systems (**SBS**) to Aetna Life & Casualty and IBM Corporation. This sale is subject

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to the negotiation and execution of a definitive agreement and to the approval of the Federal Communications Commission by the end of 1984. The sale is expected to result in an after-tax gain to **Comsat** of approximately $15 million. Under the terms of the agreement, **Comsat** will make no further contributions to **SBS**.

Commenting on the agreement, Comsat Chairman and Chief Executive Officer, Dr. Joseph V. Charyk, explained, "Major changes have occurred, and are occurring, in the structure of the domestic telecommunications industry. **SBS** is and has been, quite appropriately, responding to these changes which will require substantial capital investments over a period of years. While we have great confidence in the future of **SBS**, the magnitude of these investments, when viewed in the light of Comsat's financial resources and other business activities, makes this an appropriate decision. This will also provide Aetna and IBM with greater flexibility if they choose to seek new partners with financial resources and business interests that are compatible with the future course of **SBS**."

Comsat has been a one-third owner of **SBS** since 1975, when the partnership was formed. For 1983, **Comsat** reported a reduction in earnings as a result of its partnership interest in **SBS** of $24 million, or $1.33 per share, and, for the first six months of 1984, $8.4 million, or $.46 per share.

Videoconferencing network will serve legal community

Comsat General and the American Law Institute/American Bar Association have signed a contract to create a videoconferencing network for the legal community.

The network could become one of the nation's largest private video distribution systems with as many as 2,000 earth stations at bar buildings, law schools, private and government law practices and corporate legal departments.

The initial network, called the Law-Dedicated Network (LDN), would have one permanent "origination point"—**Comsat General**'s teleconferencing facility located on the ground floor of the Comsat headquarters building in Washington, D.C.—and some 40 "downlink" sites. Up to 25 law-related video seminars are planned for the first year of operation, with the first continuing education seminars "on the air" by January 1985, according to Lucy Eliasof, **Comsat General**'s Marketing Manager, Professional and Trade Associations. "As the network expands, more events will be added," she said, "and the network will be reconfigured to allow fully interactive communications between lawyers nationwide."

Comsat General President Robert W. Kinzie said the contract marks a crucial turning point in the development of private networks. "Recognition by the legal community of the value of private satellite networks is a giant step toward general public recognition of the value videoconferencing brings to business," Mr. Kinzie said.

Results for third quarter show mixed performances

For the quarter ending September 30, 1984, **Comsat**'s consolidated net income was $12.8 milion or $.71 per primary share. This compares to net income of $12.7 million, or $.71 per primary share, reported for the third quarter of 1983. Operating revenues for the third quarter of 1984 were $109.9 million, a decrease of $4.4 million compared to the third quarter of 1983.

Consolidated net income for the nine months ending September 30, 1984, decreased by $4.5 million, or $.26 per primary share, compared to the same period of 1983. Operating revenues for the first three quarters of this year were $322.0 million, a decrease of $10.7 million compared to 1983.

After recognizing federal income tax benefits, investment tax credits, and the elimination of intercompany transactions, the Corporation's share of losses from its partnership interest in Satellite Business Systems (**SBS**) decreased from $5.7

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WORLD SYSTEMS = Change

Joel R. Alper, President of the Comsat World Systems Division, talks about the major issues affecting Comsat's Intelsat business and describes the division's direction for the future.

The 1980s and especially the last several months have been a period of enormous change for providers and users of telecommunications services in the United States. Comsat has been no less affected than any other provider, and at the same time several issues relevant only to the conduct of international communications, some of them posing a potential threat to the health of the business we conduct as the U.S. Signatory to Intelsat, have become focal points of intense activity.

Given the pace of change in today's international telecommunications arena and the volume of issues facing us, we thought it would be very useful for our readers if we posed a series of questions to the President of our Comsat World Systems Division, the Corporation's largest business unit in terms of revenue and the one charged with the responsibility of carrying out Comsat's jurisdictional responsibilities, its Inmarsat as well as its Intelsat businesses. In the interview that follows, Joel R. Alper discusses the range of issues facing Comsat in its conduct of its Intelsat business. At the same time, he describes a course of action that, he believes, will keep Comsat strong and healthy, despite the numerous challenges it faces. The article is an edited and abridged version of a tape-recorded interview that Stephen A. Saft, Editor of Comsat Magazine, conducted with Mr. Alper in July.

Joel R. Alper became President of the World Systems Division in 1983, the culmination of a Comsat career that began in 1974. Mr. Alper holds degrees from Cooper Union, MIT and Boston University.

Q: I'm sorry to be starting off on a negative note, but it seems unavoidable. Never in the history of Comsat have we been a target of so many attacks from so many quarters as we are now. For example, several companies want to offer international satellite services that seem to be in violation of the Communications Satellite Act of 1962, under which we were established. Why do you think Comsat has become such a target of late?

ALPER: I think that we have to distinguish between those attacks which are apparently directed specifically at Comsat and how it is doing its business and those attacks which are issue oriented. Let's start off with the latter and recognize that this Administration is seeking to deregulate and foster competition in communications. The Administration began with the largest target first—domestic communications and AT&T. Having restructured that marketplace and AT&T, they are seeking ways to deregulate and/or foster competition in international satellite communications.

We strongly believe that vigorous service competition is possible, but that intersatellite competition would be devoid of benefits for the U.S. consumer. Transoceanic satellite communications already faces competition and has faced that

Joel R. Alper, President, Comsat World Systems Division. All photography by ***William J. Megna****, Chief Photographer.*

competition from its beginning—from undersea cable. World Systems' carrier customers also own the submarine cables that compete with satellites. The largest of those customers is AT&T.

At the same time, we have seen a vigorous attack mounted by certain companies that perceive **Comsat** as a competitive threat because of our technology and expertise in satellite communications, and these companies are attempting to promote legislation which would divest **Comsat** of its competitive businesses so that the Corporation only stays in its jurisdictional business. The interesting thing is that many of these same companies are attempting to get into business to compete with our jurisdictional business. It's basically a double barreled approach: Let's slice off the "competitive" side of **Comsat**, they're saying, and let's get into competition with the "noncompetitive" side of **Comsat**.

Q: We're being hit from both sides.

ALPER: That's correct. There is, of course, a more fundamental reason why we are such a prominent target and that is our success. Our initial mandate was to establish a global commercial satellite communications system. We've done that. The Intelsat system achieved global status in 1969. The services of the Intelsat system have expanded to include approximately 170 countries, of which 109 are owners. And so we have truly established a global system for users in the United States and elsewhere. The whole world communicates over **Intelsat**.

In its expansion, the system has had the benefit of improvements in technology, and through those improvements we have achieved ever decreasing costs for service. We've repeatedly reduced our rates and are now in the process of doing so again.

Q: In your opinion has the existence of Comsat ever inhibited or interfered with the development of competitive business activities in the United States?

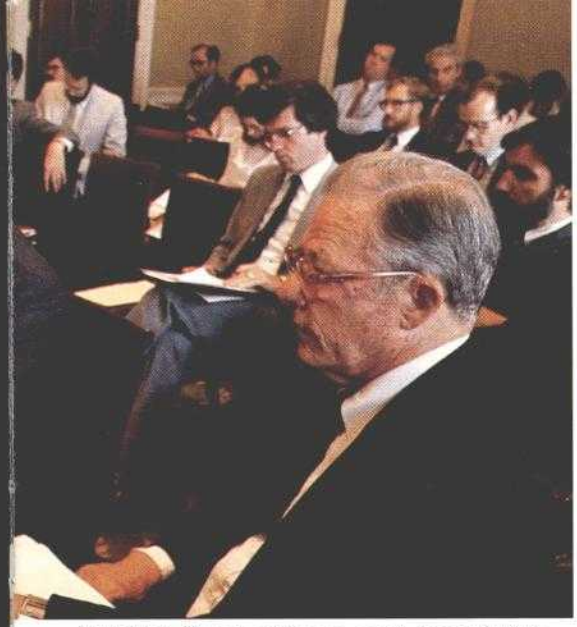
ALPER: Absolutely not. In fact, through the development of the international satellite system, we have created business opportunities for a broad range of equipment suppliers and carriers, and end users. The aerospace manufacturers in this country have had an enormous market open to them through the expansion of **Intelsat**. That's evidenced by the

Mr. Alper presents testimony at a Congressional subcommittee hearing. To his left is George Lawler, retired World Systems Vice President, Marketing who continues to serve the Corporation as a consultant

fact that of the approximately three billion dollars which **Intelsat** has expended over its close to 20 years of existence, approximately 75 percent has been spent in this country, and that's been mostly for satellites and launch vehicles. On the equipment side, there has been enormous opportunity for equipment manufacturers to develop and sell their goods and services.

In the future the opportunities for U.S. companies to make money because of the existence of the global Intelsat system will expand greatly. To facilitate those opportunities we are making some important changes in our methods of operating. We are the wholesaler dedicated to meeting the needs of any and all carriers in a cost effective, nondiscriminatory way. This means expanding service opportunities for those seeking to take advantage of our Intelsat Business Service offering. As the satellite capacity provider, the World Systems Division will be dealing with a much broader customer base than in the past, and that's going to impose on us requirements to bring a much greater segment of the communications industry into the information flow so that they can hear sooner from **Comsat** what is happening at **Intelsat** and provide feedback to **Comsat** so that we can attempt to bring an integrated view of what industry and users want into the Intelsat forum when we perform our role as the U.S. Signatory.

Q: I'm going to ask you some questions that will pertain at least to some degree to Comsat's rates or tariffs, that is, what we charge to our customers for satellite services. I think it would be very helpful to our readers if we first explain in as simple a fashion as possible the principle upon which our rates or tariffs are determined.



ALPER: Our tariffs are cost based with our costs averaged over all of our services and our facilities. Until recently we were offering our customers, who are the U.S. international service carriers and TV broadcasters, what we call a bundled tariff, which is a single charge covering both space and ground segment. We are now establishing separate tariffs for the space and ground segments.

Our tariffs are intended to recover our capital costs, depreciation, return on investment and taxes; signatory costs associated with representing the interests of the United States in **Intelsat**; the operating cost for the facilities that we own and operate, principally the earth stations; and our share of Intelsat operation and maintenance costs. All of those elements are calculated and then developed into a tariff.

There are some offsets, such as the revenue distribution we get from **Intelsat** and some ancillary services that we sell.

Recently, the FCC concluded an inquiry into the question of whether other companies should be able to buy service from **Intelsat** without incurring any of our obligations, the so-called direct access docket. The FCC said that users would not see lower prices and that the problems associated with multiple quasi-signatory roles were not demonstrated to be offset by any particular gains. Fortunately, **Comsat**'s role as U.S. Signatory and investor in **Intelsat** has been reaffirmed. That was a major decision by the FCC, and it augurs well for **Comsat** in the future.

Q: How do you answer the critics who say our rate of return has been too high?

ALPER: The answer is very simply that we don't believe that it has been too high, that there are many factors that need to be considered in looking at a regulated rate of return, among which is the cost of money. Our rate of return has tended over the past three to five years to reflect the high cost of money which was experienced during the early 1980s. As the cost of money has dropped, our rate of return has dropped.

Q: On March 30, the so-called Comsat Day, and subsequently, the FCC made a number of decisions on our structure. How do you view these?

ALPER: On cost allocations, the Commission came out with certain formulas which have no precedent that we can identify, and we're concerned about the impact of some of those determinations. We are particularly concerned that the allocation formulas will have a severe detrimental effect on **Comsat Laboratories**. In particular, if those formulas were to be applied, the corporate funded research and development program would have to be reoriented toward development work for the competitive side of the house. The question is whether the competitive side of **Comsat** needs that size program. Certainly, the World Systems Division needs it. We have identified our needs, and they are being responded to by Comsat Laboratories programs. If the competitive side of the house is obliged to pay $4 for every $1 that the World Systems Division puts in, the obvious result would be a collapse of the program.

That would be a very unfortunate outgrowth of the order. We pointed this out to the FCC. Our impressions are that the Commission didn't really focus on the impact on **Comsat Labs** of its order, and we believe that it should reconsider. That is an issue that is on-going.

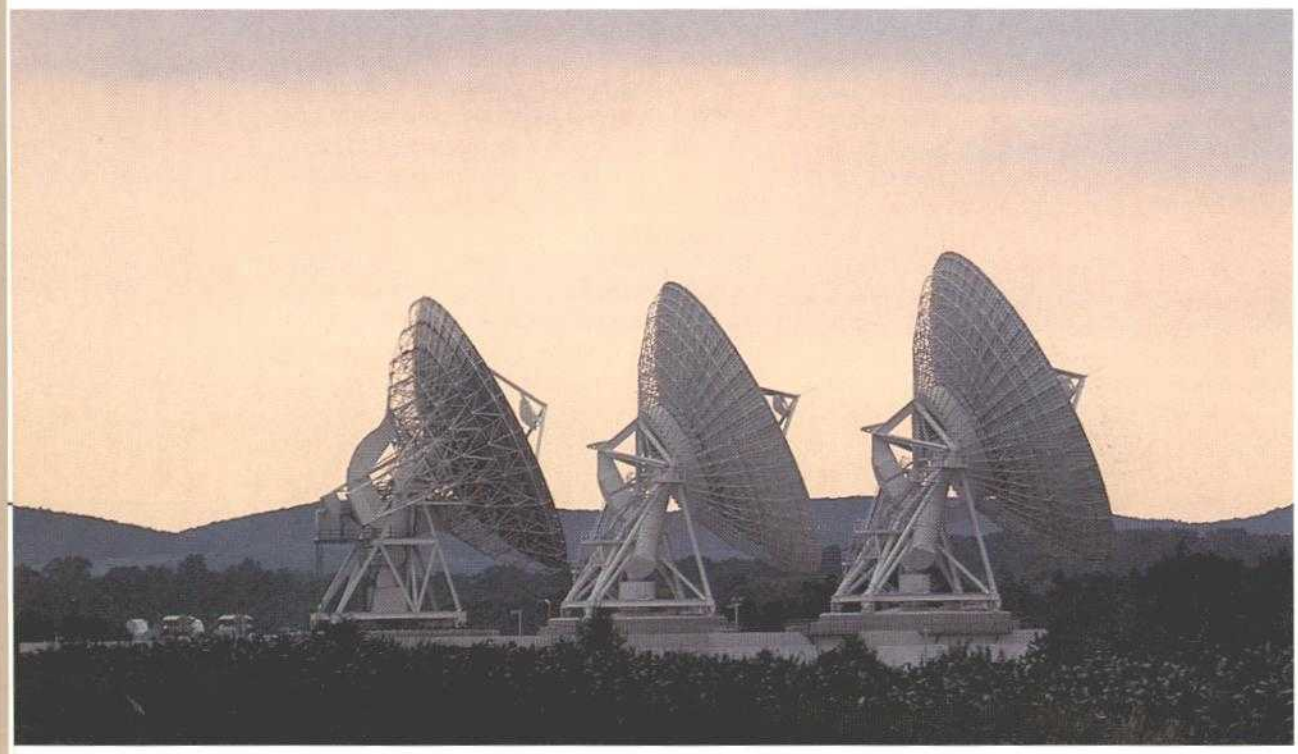
What I am afraid the FCC may not have understood is just how crucial a role **Comsat Laboratories** has played in the past successes of **Intelsat**. Having said that, I also have to recognize that we've had 20 years to grow the international system in an environment free of some of the pressures that are facing us now. We've always had cable as the competitor to the satellite system. Satellite technology developed very quickly, and the advantages of satellites encouraged our customers to put the majority of their service on satellites. The market is now evolving very rapidly, and we're facing formidable competition from

optic fibers for international communications beginning in 1988.

Hence, while technological innovation was a factor in our success in the past, it has now become absolutely essential for our success in the future. And we have to face the fact that our technology has to be much more focused on system concepts and on developing technological alternatives in a much more rapid timeframe.

Research and development activities are essential to the future of the Corporation, and certainly in our jurisdictional business there is no greater need than now for technology to lead us forward. As a matter of fact, the importance of that effort is highlighted by the fact that we are planning to move the World Systems Division to Clarksburg, Maryland, with the move scheduled to take place in the May-July 1985 timeframe.

Our goal is to derive the maximum



Roaring Creek

OPEN & OPERATIONAL

Managed and operated by Comsat World Systems Division, the new Roaring Creek, Pennsylvania, Earth Station joins the ranks of four similar U.S. mainland based earth stations operated by World Systems to provide international communications satellite services. The $50 million facility is located in a radio-quiet area 55 miles northeast of Harrisburg, Pennsylvania, near the town of Bloomsburg. It is jointly owned by **Comsat**, AT&T, RCA and Western Union International and is the most powerful and advanced earth station complex ever to be constructed in the worldwide Intelsat system of earth stations and satellites in space.

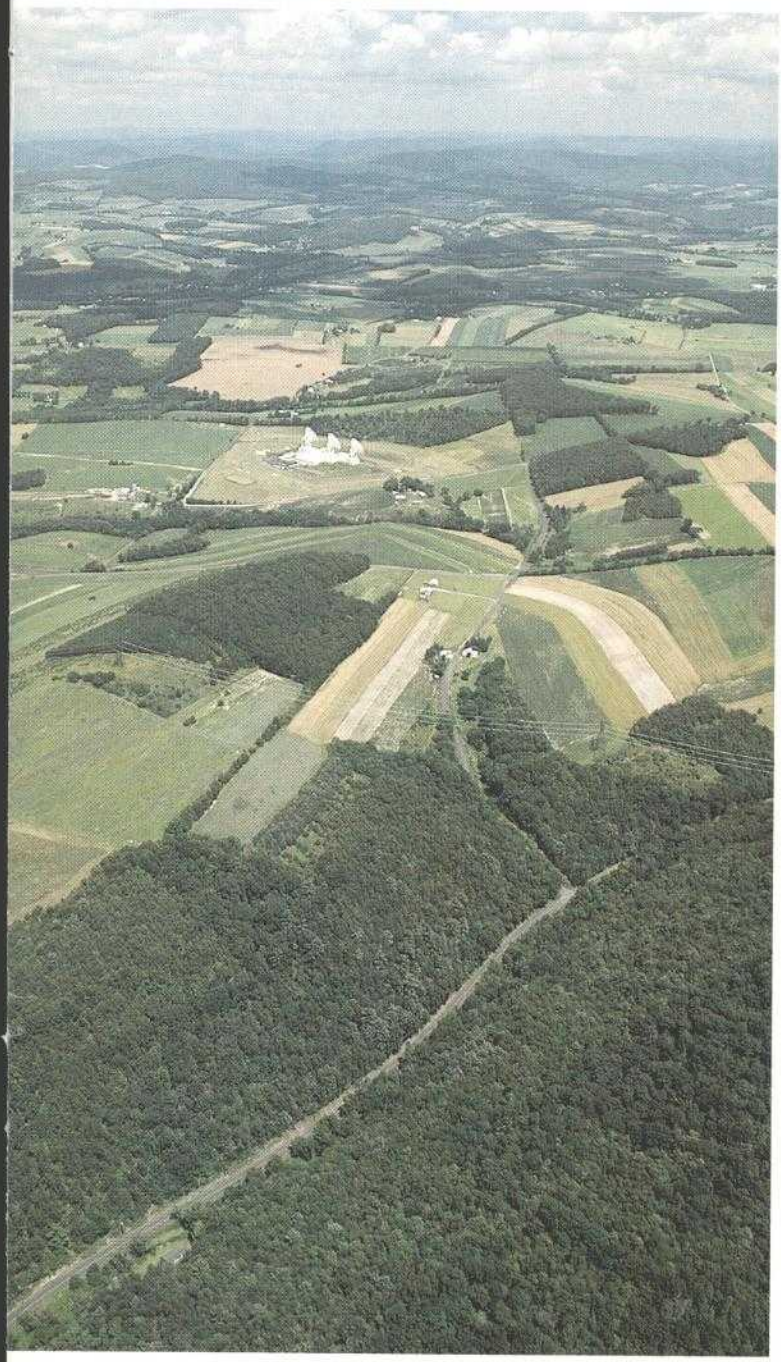
Three dish-shaped antennas tower over the Roaring Creek complex, each stretching 105 feet across. One of the three antennas operates in the lower of two satellite frequency bands, sending signals at 6 gigahertz and receiving them at 4 gigahertz. Another antenna transmits at 14 gigahertz and receives at 11 gigahertz. This antenna's 105-foot size makes it unique in the Intelsat system in that other high-frequency band antennas usually measure about 60 feet across. The larger size lessens the likelihood of signal interference, such as that which can be caused by heavy rainfall.

The third antenna, the first dual-band antenna in the Intelsat system, operates in both the lower and higher satellite frequency bands. That antenna serves as a backup to the other two antennas.

benefit possible from the impact that technology can have on our future—and to reduce certain of our costs.

Q: One of the decisions taken on Comsat Day at the FCC had to do with ESOC, the Earth Station Ownership Consortium. As I understand it, the FCC said that Comsat and its carrier customers in ESOC should work out among themselves the future ownership arrangement of the major Intelsat gateway earth stations in the United States. I'd appreciate your view of this decision.

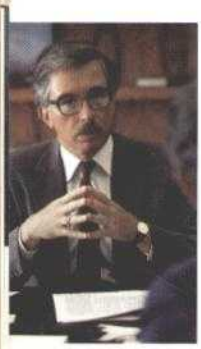
ALPER: With respect to earth stations, the Commission obviously feels it has an opportunity to inject some degree of competition. We have agreed that authorizations for earth stations for business services and television facilities should proceed, but we've urged the FCC to be cautious with respect to the multipurpose, multiuser gateway stations. Operations of these stations impact



Above, *Earth station was officially open for business when ribbon extending to center antenna was cut by, from left, Congressman Frank Harrison, County Commissioner Lucille Whitmire, Joel Alper, President, Comsat World Systems Division, and Irving Goldstein, President of Comsat.* ***Left,*** *Earth station is set amongst some of the world's most beautiful farm land.* ***Above Right,*** *Photo first published in Comsat Magazine No. 7 shows same site prior to construction.* ***Facing Page,*** *James R. Silvius is Station Director, Roaring Creek, Pennsylvania, Earth Station.*

directly on the efficiency of the space segment. Also, such stations will continue to carry the bulk of U.S. international traffic for years to come. Service carriers all need access to these stations to compete. From a practical standpoint, only **Comsat** or AT&T can financially justify ownership of such stations. We are concerned that the tentative steps taken in the Commission's Notice of Proposed Rulemaking could force **Comsat** to give up ownership in the existing multipurpose stations and leave AT&T in defacto control of all outlet facilities for U.S. international traffic. We don't think that such a result would foster competition or further the public interest. We don't think that the policymakers intend such a result and believe that the rulemaking will take a reasonable course regarding ownership and operation of multipurpose stations. Looking ahead, we see the evolving technology and earth station economies changing so that a number of service entities will be able to independently own their ground facilities for all their services. Today, however, AT&T is the only service competitor that can do this with over 80 percent of the traffic.

At present we own 50 percent of all of the facilities. The other 50 percent is owned in various portions by other carriers. The mix differs from the continental United States to Guam to Hawaii. We have proposed a combination station approach in which we would own the building, the antennas, the basic power system. The other carriers would own as much or as little of the variable service equipment as they wish. Tariffs for the services out of the earth stations would depend upon the ownership distribution.



Q: Also on Comsat Day, the FCC granted permission for the operation of a Digital Express Ku-Band earth station in Chicago by a company called IRI. What will this decision mean for the future of World Systems Division and for Comsat in general?

ALPER: We feel that there is an untapped market for wideband digital services between the United States and the rest of the world and that there's an opportunity here for competition in provision of services through a variety of earth station types. We want to stimulate this market for IRI and all other carriers. The Commission also has authorized **Comsat** to build a similar type of facility in New York, which we believe will be an effective common user facility.

Q: What are your aspirations for the new Digital Express service? Who will use it, and how much of a factor could it be for World Systems Division revenues in the near future?

ALPER:The service is targeted towards business users, large and small. The small user has access to a 64 kilobit circuit. A large user can lease higher bit streams. In fact, recently **Intelsat** authorized the lease of full and fractional transponders for business service. So the target is the business community—private line, private network, nonswitched services. At the right price, there is going to be a tremendous market. We forecast a slow growth in 1985, but by the end of the decade it wouldn't surprise me at all to see this kind of service representing somewhere between 10 and 15 percent of World Systems Division revenues.

Q: Comsat and its partners in ESOC have recently opened a beautiful new earth station in central Pennsylvania, the Roaring Creek Earth Station. Is there a future for the large high capacity earth stations like Roaring Creek, or does the future belong to the smaller, more specialized Digital Express type of earth station?

ALPER: Recent press focus on Digital Express has tended to cloud the fact that the bulk of international communications is still message traffic—message toll service. That's why we have Roaring Creek. It is well located. It's close to AT&T's backbone network, extending from Boston and New York south and west, and it's just the right location for the large quantities of switched services involving Europe and Latin America.

At the same time, we see the need for the small-business-service type facility and television facility expanding, but as long as there are large volumes in traffic that have to be piped across the oceans, there will be a role for the large international gateway facilities. In fact, having both types of facilities will expand our ability to meet a range of user needs.

Q: You've already mentioned developments, such as the advent of fiber optic transoceanic cable, that could have a profound impact on the way that Intelsat operates in the future. How is Intelsat changing to meet the changed

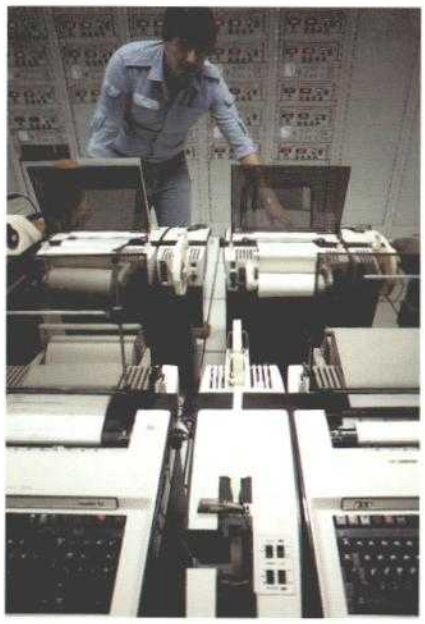
business environment we find in the mid-1980s and what other changes are necessary in your opinion in the future?
ALPER: The first and most visible change is that **Intelsat** has a new director general, Richard Colino, a man who, we believe, is very much in tune with the future needs of **Intelsat**. **Intelsat** is already changing in response to his leadership. We're seeing a host of new services being offered. We're seeing a tightening of the management of the organization, a move towards cost reduction, a concern with the efficient utilization of facilities, all of which structure **Intelsat** to operate in the 1980s.

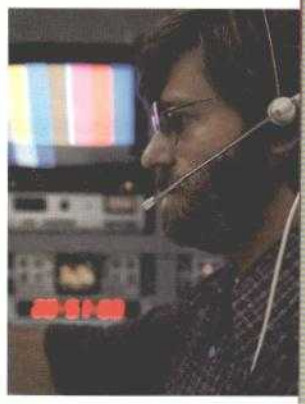
What requires more attention in the immediate term relates to **Intelsat**'s overall charging policy and ways for it to encourage more and more efficient use of the space segment. We, and our customers, are looking for that opportunity. If we can find a way to keep **Intelsat** viable while offering the prospect of lower cost to our customers, we believe that we can stimulate new demand. It's a very difficult challenge because while we as a major signatory have the opportunity through technological innovation to use the satellite system more efficiently, many of the developing countries are not at the point where they can take advantage of advanced technology. There is a potential for the cost burden of **Intelsat** to be shifted to the countries which can't take advantage of these efficiencies, and that would be impossible for them to accept.

Q: As you've pointed out in this interview, the Comsat World Systems Division is faced with many challenges. I wonder if you would mind summarizing how, over the next three to five years, you see us changing to meet those challenges?
ALPER: We see an environment in which international communications services will grow. In fact, depending upon the approach of the service providers, it can grow astoundingly. We are extremely well positioned to take advantage of that growth. We have a jurisdictional position in both the Intelsat and Inmarsat markets. We have a very firm position in the earth stations services market. We are moving in the Intelsat environment to innovate services. We will be moving with **Intelsat** to innovate their pricing policy. We are looking at means to enhance the kinds of services that we provide at the earth stations. We are talking to customers—not only existing customers but potential new customers—with respect to what can be obtained through the satellite system. We are making a major effort to inform the communications managers of the large international communications user companies—the banks, the insurance companies, the stock brokerage firms, the companies that have major international interests—about what benefits they can obtain through the international satellite system. By talking to them, we are learning from them at the same time what they want and how they want it packaged. And we intend to work with our carrier customers to ensure that this market can be developed. It is in their interests and in our interests to do this.

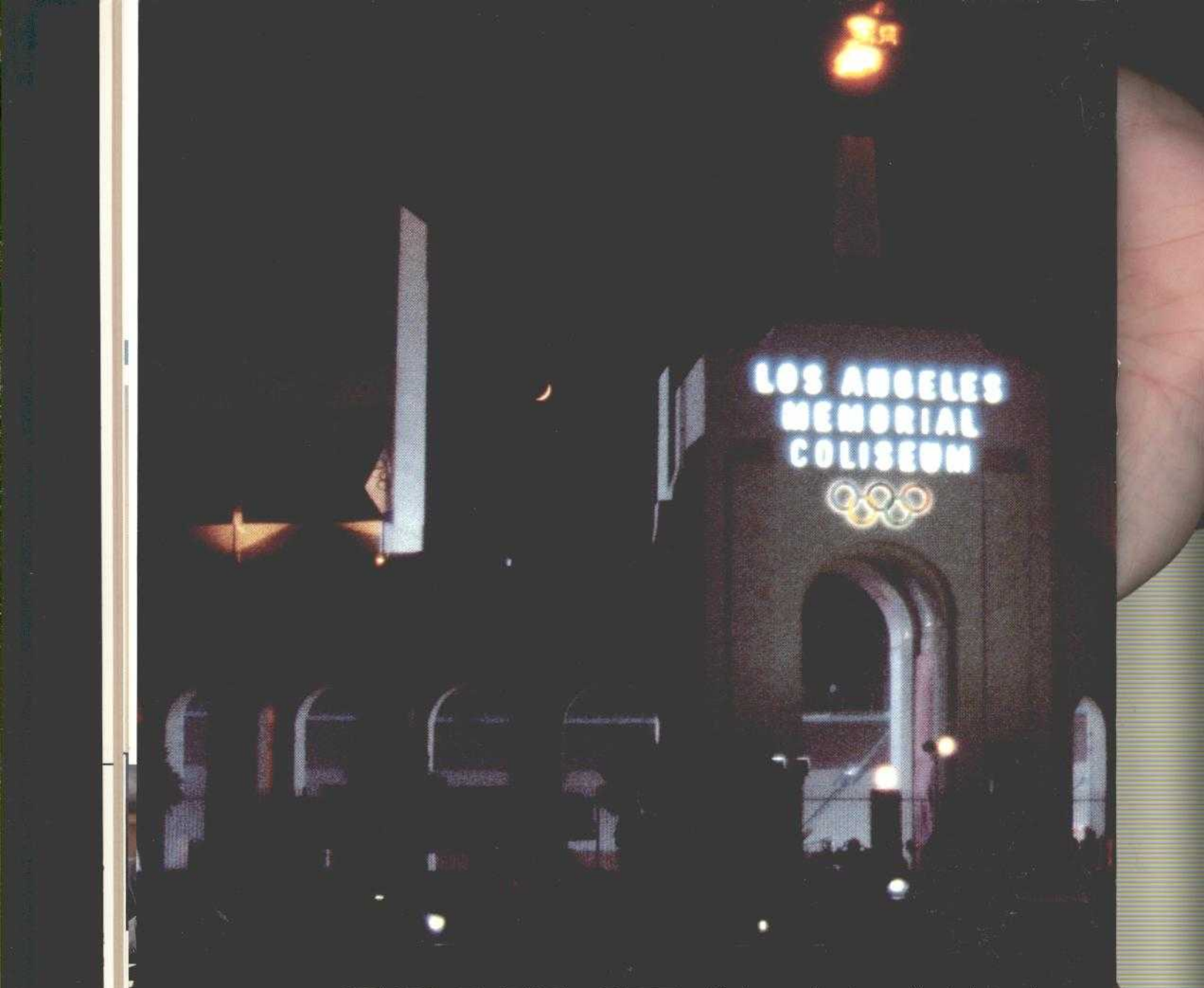
If the Corporation is authorized to provide end user services, there comes another decision point for the company. Do we want to get into that market? How do we want to get into that market?

We have not been sufficiently market oriented. That is true. But we are changing and we are learning. The first 20 years of **Comsat**'s existence could be characterized as an exciting period of technologically driven growth. The next ten years—the generations are shortening—is the period of competition. We will continue to face and meet the challenge of maintaining a leadership position in an increasingly competitive marketplace.





Two of the approximately 30 staff members of the Roaring Creek, Pennsylvania, earth station: Joseph E. Zielinski, left, Electronics Technician, with earth station teletype equipment, and David N. Bulk, Operations Shift Supervisor.



COMSAT & THE OLYMPICS

Handling a total of 2,628 transmission hours, the Comsat World Systems Division brings the 1984 Summer Olympics Games in Los Angeles to the world.

First came the show with singing and dancing and the launching of thousands of balloons. Next came the parade of athletes from the 140 participating countries and territories. Then, emerging from the tunnel, a young woman carrying a torch was trying to make her way around the stadium track, her way often blocked—temporarily—by the throngs of happy athletes spilling over from the stadium's packed infield. The torch-carrier was Gina Hemphill, granddaughter of Jesse Owens, winner of four gold medals at the Olympic Games in 1936.

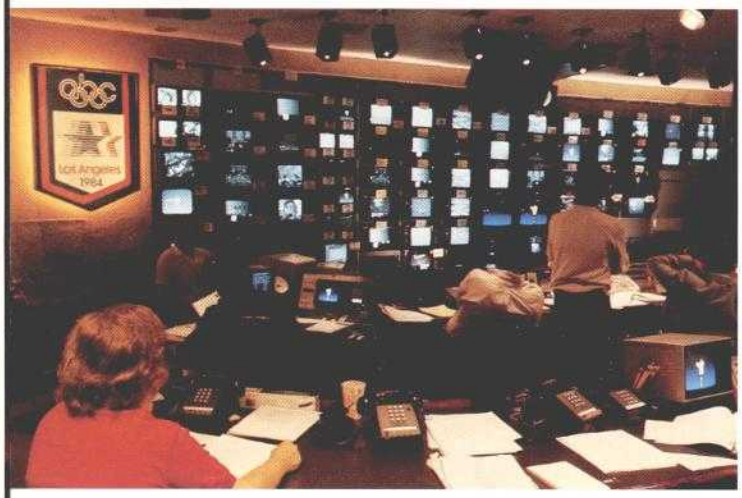
Gina Hemphill passed the torch to Rafer Johnson, Olympic gold medalist in the Decathlon, and it was Johnson who ran up what seemed a mile-high set of steps to ignite the stadium's torch.

Thus began the XXIII Olympiad, better known as the 1984 Summer Olympic Games, in Los Angeles. The eyes and ears of the world were focused upon the Los Angeles Coliseum where the opening ceremonies and many of the subsequent events took place. The images and the sounds of this extremely successful event were transmitted to over 60 countries around the world to an estimated audience of about two billion people. No other event has been witnessed by so many people, and it was **Comsat** that brought this history-making 16-day spectacle to the world.

Specifically, **Comsat** provided the U.S. connection via the Intelsat system for an average of over 150 hours of daily programming for a total of 2,628 transmission hours. This coverage was crammed through six satellites over the Atlantic and Pacific Oceans. Two overseas broadcasters, Network Ten Australia and Television New Zealand, leased a 24-hour-per-day and a 16-hour-per-day channel, respectively, uplinked out of earth station facilities in Santa

*by **Arnold W. Meyers, Left,** Director, Network Operations, and **Jay S. Trager, Right,** Assistant Director, Broadcast Services, Comsat World Systems Division. All photography by **William J. Megna**, Chief Photographer.*

Opening Pages, The Los Angeles Coliseum at night during Games. **Right,** Men's bicycle race in Mission Viejo and ever present ABC Television camera. **Left,** ABC's Master Control Center for the Summer Olympic Games, central receive and distribution point for all transmissions. **Below Left,** The three people who manned the Comsat office at the International Broadcast Center were, from left, Jay S. Trager (co-author), George Lawler, and Milton Bush.

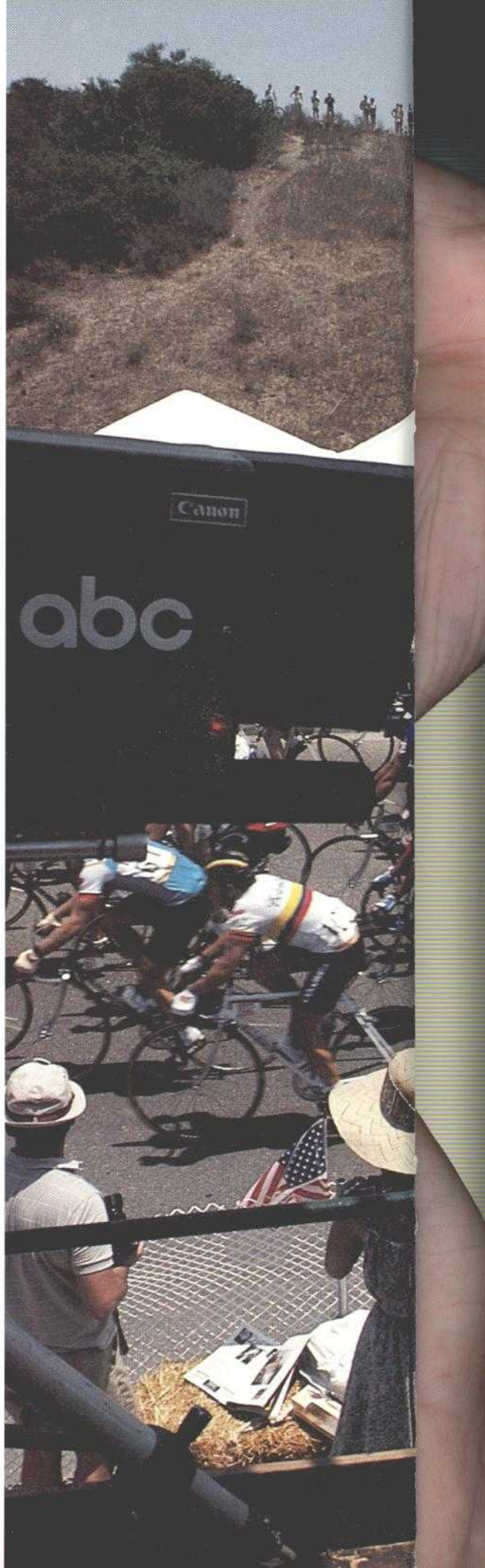


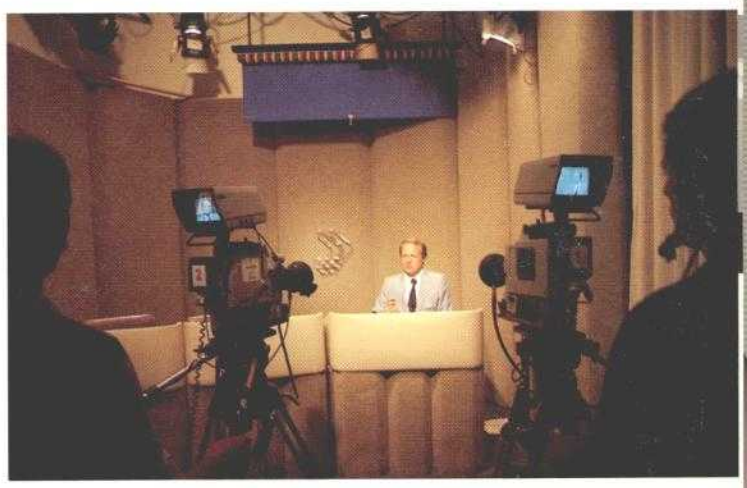
Paula, 50 miles northwest of Los Angeles, for the full duration of the Games.

The 1984 Summer Olympics began for **Comsat** in 1979 upon receipt of the first orders for television service from the European Broadcast Union. Orders for transmission time continued right through to the final day of the Games. The planning by Comsat World Systems Division staff became especially intense over the past two years to make certain that we could accommodate each Olympic requirement.

Representatives of World Systems met on numerous occasions with U.S. international carriers, overseas broadcasters and **Comsat**'s partner signatories in the Intelsat organization to determine television service requirements in the Atlantic and Pacific Ocean Regions. **Comsat**'s plans for accommodating the overseas broadcasters' requirements were redefined frequently over the last two years. These plans were presented to **Comsat**'s customers and Intelsat partners along with the ABC Television organization, the officially designated broadcaster of the Games, and were reconciled with the developing overseas television demand.

Since resources are limited, extraordinary steps were taken to accommodate





Above Left, *Senior staff in Television New Zealand's Master Control Room at International Broadcast Center.* ***Above Right,*** *Torus antenna installed at Comsat General's Santa Paula, California. Earth Station received feeds via U.S. domestic satellite from Television New Zealand and Network Ten Australia for transfer through another antenna to Intelsat satellite.* ***Bottom,*** *Ken Burslem, Network Ten Australia broadcaster, on camera at International Broadcast Center.*

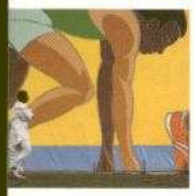
a worldwide event of this magnitude. The eight TV channels normally provided by the Comsat World Systems Division available over four satellites were expanded to 14 channels over six satellites, and equipment was diverted to earth stations requiring additional capability to bring the event to the world. World Systems Division earth stations at Jamesburg, California; Brewster, Washington; Andover, Maine; Etam, West Virginia; and Paumalu, Hawaii, which normally provide television services, were all utilized for Olympics transmission. In addition, World Systems leased additional earth station facilities from Comsat General Corporation at its Santa Paula, California, complex to meet Australia and New Zealand requirements. The provision of these services necessitated the creation of special Olympic TV contracts with overseas broadcasters and FCC operating and tariff authority.

Special preparation and testing was conducted on each satellite television channel to insure the technical quality of the service. Consideration was given to the host of technical failures that could occur and the measures that would be taken in the event of a failure. Each telecast is important and a failure of equipment or interruption to service would have been unacceptable. Every reasonable precaution was taken to insure continuous service integrity.

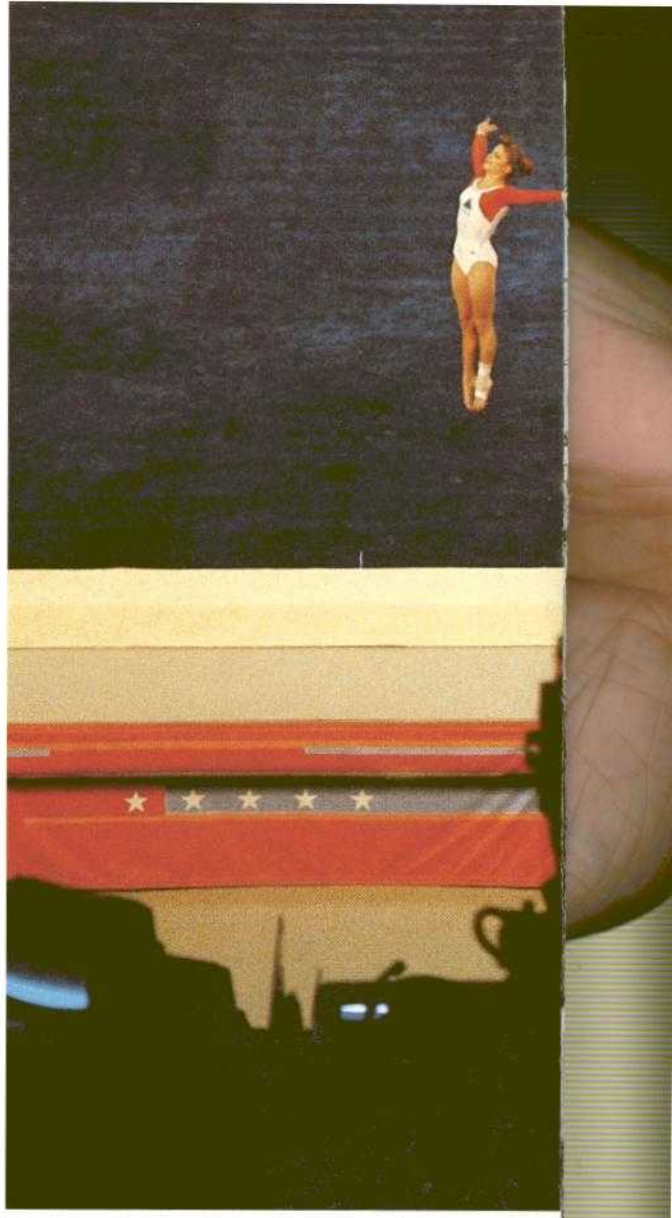
Thinking of the unthinkable: Should a failure have occurred and service been interrupted, a fine tuned fault finding procedure would have been implemented that restores service to normal operation with absolutely minimum interruption. At Comsat earth stations and within the Intelsat network these are the procedures that allow immediate attention to any interruption. In addition a sophisticated backbone network of voice and teletype communication existed between each international earth station carrying Olympic service that allowed instant communication in the event a failure occurred.

Beyond an earth station or associated technical equipment failure, a more serious concern was total satellite failure; again action plans were in place to protect the Olympic service should the unthinkable have occurred.

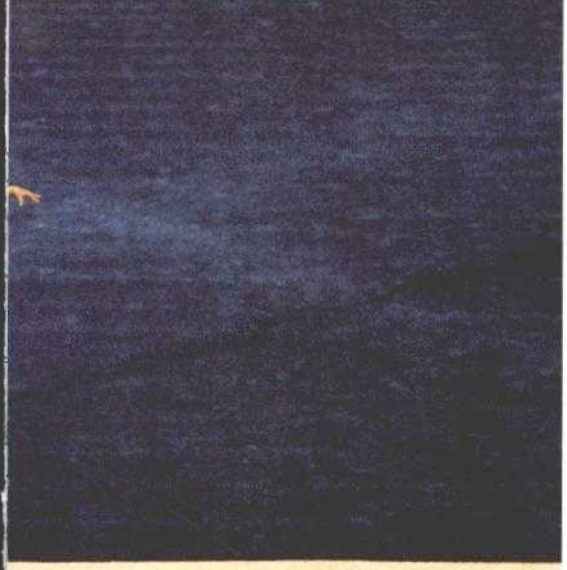
During the 16 days of the Games, Comsat World Systems Division representatives provided on site support at ABC's Olympics International Broadcast

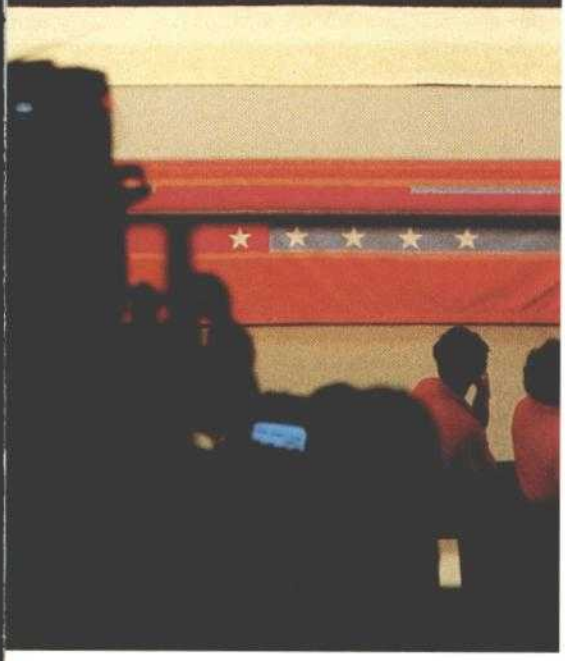


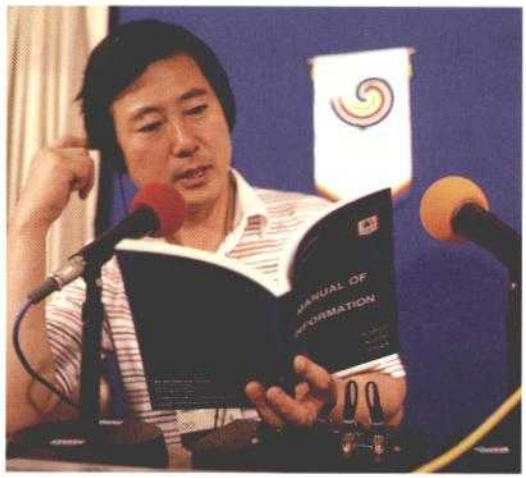
***Right,** U.S. gymnast performs floor exercise during Olympic competition. **Below Right,** Two staff members of TVB Hong Kong operating out of Television New Zealand master control center at International Broadcast Center. **Below,** Section of a mural at Los Angeles Coliseum.*



Center (IBC) located in Hollywood. Working alongside the overseas television broadcasters and U.S. international carriers, the Comsat staff accommodated immediate changes in the scheduling of television transmission requirements. Such immediate response was required when an overseas television authority







sought to focus attention on a native athlete or national team in contention for a medal. Direct connection was provided from the IBC to Comsat Headquarters using specially installed transmission lines to access and manipulate detailed data on each individual telecast. The Comsat staff at the International Broadcast Center also provided technical liaison to the operations and earth stations staffs of World Systems to quickly resolve technical problems.

Even the exhibition sports events produced some last-minute television requirements, the case with a baseball game involving Taiwan. Because the normal satellite connection between the United States and Taiwan was occupied, special arrangements were made involving a double-hop from Jamesburg, California, to Paumalu, Hawaii, and then from Paumalu to the Taiwan-Taipei earth station. Thus an audience of millions on Taiwan were able to view their baseball team in action. Arrangements like this were not unusual throughout the Olympics.

Comsat not only provided special television coverage during the Olympics, but nearly 100 special circuits to accommodate radio broadcasts that presented blow-by-blow event description and phone calls by the athletes themselves.

Now that the very successful XXIII Summer Olympiad is behind us, we're already in the thick of planning for the 1988 Winter (Canada) and Summer (S.Korea) Games and have already consulted with the Korean Telecommunications Authority at their request to assist in communications facilities planning. After all, these Games are only four years away.

Above, *Pjun Ungjun doing Olympics sportscast at International Broadcast Center studio of Korean Broadcast System.* **Below Left,** *Staff of Degue Broadcasting transmitting television to Nigeria.* **Below,** *Olympic torch at Los Angeles Coliseum prior to its lighting at start of games.*

Comsat's Satellite Locations Guide an introduction

by **Carl H. Schmitt,**
Assistant to the Director for Communications, Comsat General Corporation.

The communications satellite locations guide on the following pages incorporates both a table and a chart to show the commercial communications satellites in geosynchronous orbit and those planned for launch through 1990. The table, more comprehensive than the chart, provides background data on frequency bands, type of service, country and/or organizational sponsor, or alternate name. If the launch date cannot be determined for a specific satellite or is unknown, a "u" has been used in place of the date.

The table is organized on the basis of increasing East and increasing West longitude. A prefix code indicates the status of each satellite as of June 25, 1984 and reveals whether it is in orbit (i) or whether—in the case of planned satellites—the location is merely being sought (b) by the sponsoring organization prior to other registration steps having been taken or has been tentatively assigned (a) by the U.S. Federal Communications Commission (FCC). Those planned U.S. satellites for which applicants have filed (f) construction permits with the Federal Communications Commission are indicated as well. Other prefix codes refer to the status as assigned by the ITU's International Frequency Registration Board (IFRB): (A) advance published, the initial step; (C) in the process of coordination; and (N) in notification, the final step.

The chart portion of the satellite locations guide is divided into two parts, and each half consists of an inner and an outer ring of satellites as viewed from above the North Pole. The left portion of the chart depicts those satellites planned or operating which use frequencies from UHF to 10.7 gigahertz. Satellites using the C-Band—6/4 gigahertz—predominate, but those using the UHF, L, S and X Bands, defined in the table, are represented as well. In the inner ring are multiple band satellites having frequencies above as well as below the 10.7 gigahertz demarcation. The right portion of the chart shows planned and operating satellites using bands above 10.7 gigahertz. Satellites operating in the K Band—14/12 and 14/11 gigahertz—predominate, but also represented are satellites operating at 17 gigahertz for broadcasting and those operating above 20 gigahertz. The frequency band for satellites operating above 20 gigahertz has been designated as "E." In the inner ring, as in the case for the left portion of the chart, are multiple band satellites having frequencies above as well as below the 10.7 gigahertz demarcation.

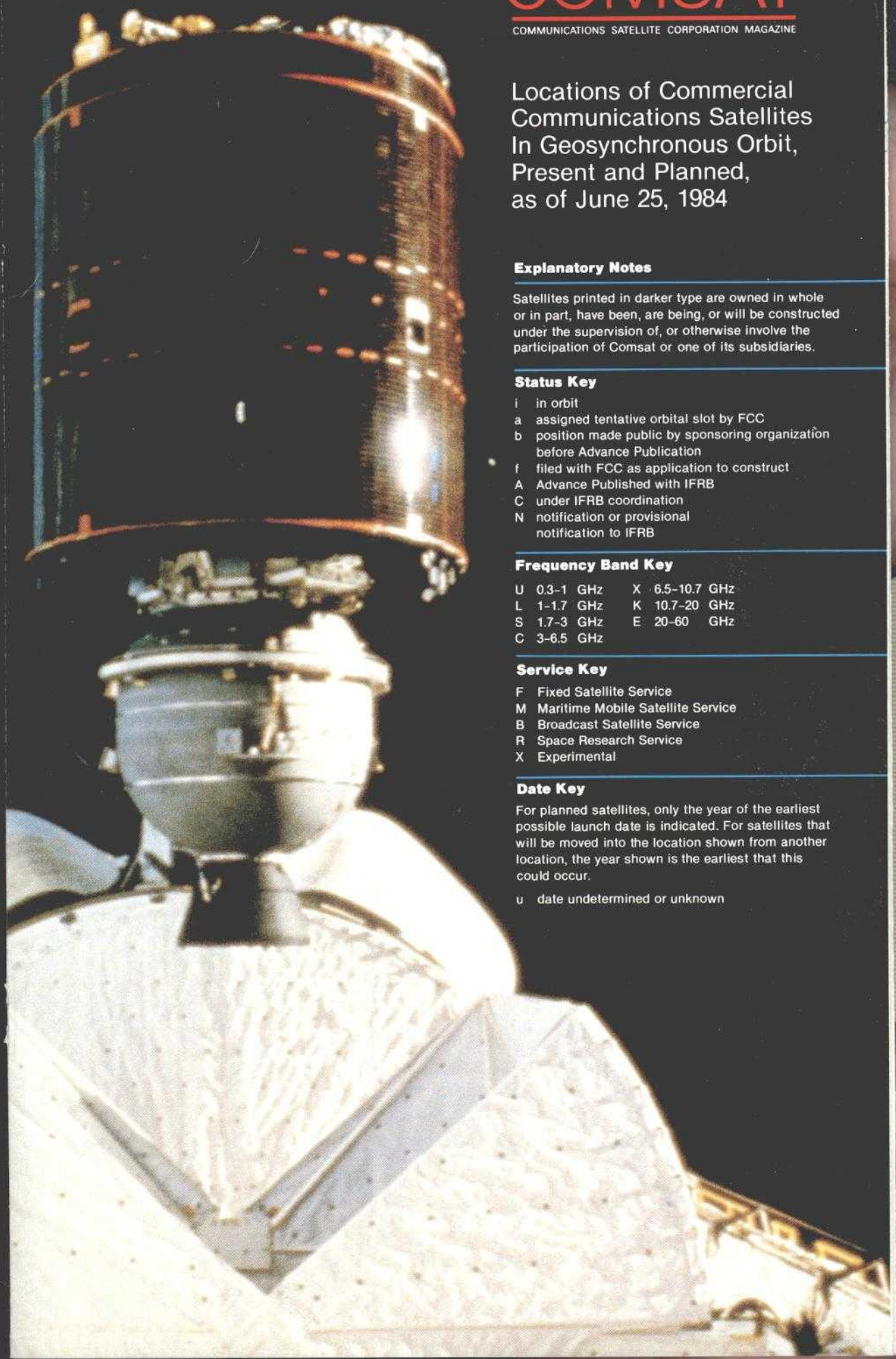
The chart does not show those satellites listed in the table that have "b" status or have an unknown or undetermined launch date.

The information that is the basis for the listings in the table and for the locations shown on the chart comes from many sources. Much of this information has come from the sponsoring organizations themselves, and, for in-orbit satellites, we have also consulted tracking data from several reliable sources. For planned satellites, information from sponsoring organizations has been given precedence over that published by the IFRB. IFRB lists do not appear to be updated frequently enough to reflect cancelled or indefinitely postponed satellites.

Orbit locations are subject to change during the notification process and, hence, should not be considered final until after the notification process has been completed. Notification takes place after Advance Publication and Coordination procedures have been completed. Broadcast satellites have pre-assigned orbital locations for each country and, hence, do not come under this process.

An update of the table will be produced for year-end 1984 in January 1985. Write to the author at Comsat General Corporation for a copy.

COMSAT
COMMUNICATIONS SATELLITE CORPORATION MAGAZINE



Locations of Commercial Communications Satellites In Geosynchronous Orbit, Present and Planned, as of June 25, 1984

Explanatory Notes

Satellites printed in darker type are owned in whole or in part, have been, are being, or will be constructed under the supervision of, or otherwise involve the participation of Comsat or one of its subsidiaries.

Status Key

- i in orbit
- a assigned tentative orbital slot by FCC
- b position made public by sponsoring organization before Advance Publication
- f filed with FCC as application to construct
- A Advance Published with IFRB
- C under IFRB coordination
- N notification or provisional notification to IFRB

Frequency Band Key

U	0.3–1 GHz	X	6.5–10.7 GHz
L	1–1.7 GHz	K	10.7–20 GHz
S	1.7–3 GHz	E	20–60 GHz
C	3–6.5 GHz		

Service Key

- F Fixed Satellite Service
- M Maritime Mobile Satellite Service
- B Broadcast Satellite Service
- R Space Research Service
- X Experimental

Date Key

For planned satellites, only the year of the earliest possible launch date is indicated. For satellites that will be moved into the location shown from another location, the year shown is the earliest that this could occur.

- u date undetermined or unknown

Status & Location	Frequency Band	Name	Service	Country &/or Organization	Date
0°	A1.0°E	U,X,K	GDL-5	F	Luxembourg	85
	A4.0°E	S,C,X,K	Telecom-1C	F	France	85
	i5°E	U,K	OTS-2	F	ESA	78
	A5°E	K,E	Tele-X	B,F	Nor, Swe, Fin	86
	A7°E	S,C,E	F-Sat 1	F	France	87
	A7°E	K	Eutelsat I-3	B,F	ESA, ECS-3	84
	A10°E	S,C,E	Apex	B,F	ESA	u
	A10°E	K	Eutelsat	B,F	ESA	u
	i10°E	K	ECS-1	F	ESA	83
	A12°E	S,C	Prognoz-2	X	USSR	u
	N13°E	E	Italsat	F	Italy	86
	A13°E	K	Eutelsat 1-2	B,F	ESA, ECS-2	84
	A14°E	C	Nat Sat-1	F	Nigeria	u
	A15°E	C,K,E	AMS-1, -2	F	Israel	86
	A16°E	C	Nat Sat-2	F	Nigeria	u
	16°E	U,X,K,E	Sicral-1A	M,B,F	Italy	87
	C17°E	K	SABS	B,F	Saudi Arab.	84
	A19°E	X,K	GDL-6	F	Luxembourg	85
	C19°E	**S,C**	**Arabsat-I**	**F,B**	**Arab Lg**	**84**
	A20°E	C	Nat Sat-1	F	Nigeria	u
	A22°E	U,X,K,E	Sicral-1B	M,F,B	Italy	87
	A23.5°E	S,K,E	DFS-1	F,B	Germany	87
	N26°E	**S,C**	**Arabsat II**	**F,B**	**Arab Lg**	**85**
	C26°E	K	Zohreh-2	F,B	Iran	u
	A28.5°E	S,K,E	DFS-2	B,F	W Germany	87
	A32°E	S,K	Videosat-1	B	France	87
	C34°E	K	Zohreh-1	B,F	Iran	u
	i34.8°E	C	Raduga-11	F	USSR	82
	N35°E	S,C	Prognoz-3	X	USSR	u
	i35.7°E	C,X	Gorizont-5	F	USSR	82
	i35.8°E	C	Raduga-9	F	USSR	81
	A38°E	K	Paksat-1	F,B	Pakistan	86
	C40°E	C	Statsionar-12	F	USSR	84
	C41°E	K	Zohreh-4	F,B	Iran	u
	A41°E	K	Paksat-2	F,B	Pakistan	86
	i42.1°E	C	Raduga 13	F	USSR	83
	C45°E	K	Loutch-P2	F	USSR	u
	N45°E	C	Statsionar-9	F	USSR	u
	C45°E	U,L	Volna-3	M	USSR	u
	C47°E	K	Zohreh-3	F,B	Iran	u
	i48.4°E	U,C	Ekran-3	B	USSR	79
	i52°E	C,X	Gorizont-9	F	USSR	84
	N53°E	K	Loutch-2	F	USSR	u
	A53°E	C	Statsionar-5	F	USSR	u
	N53°E	S	Volna-4	M	USSR	u
	C57°E	**L,C**	**IS V MCS-C**	**M**	**Intelsat**	**84**
	i57°E	**C,K**	**IS V F-1**	**F**	**Intelsat**	**81**
	A57°E	**C,K**	**IS V-A Ind 2**	**F**	**Intelsat**	**85**
	A57°E	**C,K**	**IS VI Ind 2**	**F**	**Intelsat**	**87**
	C60°E	**L,C**	**IS V MCS-B**	**M**	**Intelsat**	**u**
	i60°E	**L,C,K**	**IS V F-7**	**F,M**	**Intelsat**	**83**
	A60°E	**C,K**	**IS V-A Ind 1**	**F**	**Intelsat**	**84**
	b60°E	**C,K**	**IS VI Ind**	**F**	**Intelsat**	**88**
	i62.9°E	**S,C,K**	**IS V F-5 MCS**	**F,M**	**Intelsat**	**82**
	A63°E	**C,K**	**IS V-A Ind 3**	**F**	**Intelsat**	**u**
	i64°E	U,C	Ekran-1	B	USSR	79
	C64.5°E	**U,L,C**	**Marecs Ind 1**	**M**	**Inmarsat**	**86**
	i65°E	U,K	Sirio	B,F	Italy CNR	77
	C66°E	**C**	**IS IV-A Ind**	**F**	**Intelsat**	**u**
	C66°E	**C,K**	**IS V Ind 4**	**F**	**Intelsat**	**84**
	C66°E	**L,C**	**IS MCS Ind D**	**M**	**Intelsat**	**u**
	i69°E	U,C	Ekran-9	B	USSR	82
	A70°E	C	STW-2	F	PR China	85
	i72.5°E	**L,C**	**Marisat F-2**	**M**	**US-ComGen**	**76**
	C73°E	**L,C**	**Marecs Ind 2**	**M**	**Inmarsat**	**83**
	i73.4°E	U,S,C	Insat-1B	F	India	83
	i75.7°E	C	Raduga-4	F	USSR	78
	i77°E	C	Palapa-2 A-2	F	Indonesia	77
	C80°E	C	Potok-2	F	USSR	u
	N80°E	S	Prognoz	X	USSR	u
	N80°E	S,C	Prognoz-4	R	USSR	u
	C80°E	C	Statsionar-13	F	USSR	u
	i82.7°E	C	Raduga-12	F	USSR	83
	i83°E	C	Palapa-1 A-1	F	Indonesia	76
	i84°E	U,C	Ekran-8	B	USSR	u
	C85°E	K	Loutch-P3	F	USSR	u
	C85°E	U,L	Volna-5	M	USSR	u
	i85.2°E	C	Raduga-14	F	USSR	84
	i88.4°E	C,X	Gorizont-8	F	USSR	83
	i89.6°E	U,X	Ekran-7	B	USSR	81
	N90°E	C	Statsionar-6	F	USSR	u	**90°E**
	N90°E	K	Loutch-3	F	USSR	u
	C90°E	U	Volna-8	M	USSR	u
	b94°E	U,S,C	Insat-1C	F	India	86
	i95°E	C	Gorizont-6	F	USSR	82
	N95°E	K	CSDRN	R	USSR	85
	i95.3°E	U,C	Ekran-6	B	USSR	80
	i98°E	U,C	Ekran 11	B	USSR	83
	i98°E	U,C	Ekran 12	B	USSR	84
	N99°E	U,C	Statsionar-T	B	USSR	u
	C99°E	U,C	Statsionar-T2	B	USSR	u
	N108°E	**C**	**Palapa-B1**	**F**	**Indonesia**	**u**
	b108°E	K	BS-3A	B	Japan	89
	i110°E	U,K	BS-2A	B	Japan	84
	b110°E	U,K	BS-2 B	B	Japan	85
	b110°E	K	BS-3B	B	Japan	90
	N113°E	**C**	**Palapa-B2**	**F**	**Indonesia**	**84**
	i114.7°E	C,E	Sakura (C.S.)	X	Japan	77
	N118°E	**C**	**Palapa-B3**	**F**	**Indonesia**	**u**
	i125°E	C	STW-1	F	China	84
	i125.9°E	C	Raduga-15	F	USSR	84
	C128°E	C	Statsionar-15	F	USSR	84
	i130°E	U,L,S,E	ETS-2	R	Japan	77
	b132°E	U,S,C	CS-3	F	Japan	88
	i136°E	U,C,E	CS-2B	B	Japan	83
	N140°E	U,K	Loutch-4	F	USSR	u
	N140°E	U	Volna-6	M	USSR	u
	N140°E	C	Statsionar-7	F	USSR	u
	A145°E	C	Statsionar-16	F	USSR	87
	C150°E	C	CSE	F	Japan	85
	C156°E	K	Aussat-1	B,F	Australia-OTC	85
	C160°E	K	Aussat-2	B,F	Australia-OTC	85
	C164°E	K	Aussat-3	B,F	Australia-OTC	90
	A173°E	**C,K**	**IS V-A Pac 1**	**F**	**Intelsat**	**87**
	A173°E	**C,K**	**IS V Pac 1**	**F**	**Intelsat**	**87**
	i174°E	**C**	**IS IV-A F-6**	**F**	**Intelsat**	**78**
	C174°E	**C,K**	**IS V-A Pac 1**	**F**	**Intelsat**	**88**
	A176°E	**C,K**	**IS V-A Pac 2**	**F**	**Intelsat**	**87**
	A176°E	**C,K**	**IS V Pac 2**	**F**	**Intelsat**	**86**
	i176.2°E	**U,L,C**	**Marisat 3 Pac**	**M**	**US-ComGen**	**76**
	C177.5°E	**U,L,C**	**Marecs Pac 1**	**M**	**Inmarsat**	**84**
	i179°E	**C**	**IS IV-A F-3**	**F**	**Intelsat**	**78**
	C179°E	**C,K**	**IS V Pac**	**F**	**Intelsat**	**84**
	A179°E	**C,K**	**IS V-A Pac 3**	**F**	**Intelsat**	**u**
	C179°E	**L,C**	**IS MCS Pac A**	**M**	**Intelsat**	**85**
	b180°E	**C,K**	**IS V, V-A**	**F**	**Intelsat**	**87**

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	Status & Location	Frequency Band	Name	Service	Country &/or Organization	Date
0°	i1°W	C	IS IV F-8	F	Intelsat	74
	C1°W	C,K	IS IV-A Atl-2	F	Intelsat	85
	A1°W	C,K	IS V	F	Intelsat	86
	C1°W	C,K	IS V Cont 4	F	Intelsat	u
	C1°W	C,K	IS V-A Cont 4	F	Intelsat	u
	N4°W	C	IS IV Atl-1	F	Intelsat	u
	C4°W	C	IS IV-A Atl-1	F	Intelsat	85
	C4°W	C,K	IS V Cont 3	F	Intelsat	87
	C4°W	C,K	IS V-A Cont 3	F	Intelsat	87
	C5°W	L,C,X,K	Telecom 1B	F	France	84
	C8°W	C,X,K	Telecom 1A	F	France	84
	A10°W	X,K	GDL-4	F	Luxembourg	85
	i10.5°W	C,X	Gorizont 4	F	USSR	80
	C11°W	S,K,E	F-Sat-2	F	France	86
	i11.5°W	C	Symphonie 2	R	Fr, W. Germ	75
	N14°W	K	Loutch 1	F	USSR	u
	A14°W	L	Volna 2	M	USSR	u
	C14.4°W	C	Potok-1	F	USSR	u
	i15°W	U,L,C	Marisat F-1	M	US-ComGen	76
	A16°W	C	Statsionar-11	F	USSR	84
	N16°W	K	WSDRN	R	USSR	85
	b16.5°W	C	IS IV-A	F	Intelsat	86
	b16.5°W	C,K	IS V-A or V-B	F	Intelsat	87
	A18.5°W	K,C	IS V-A Atl-4	F	Intelsat	87
	i18.5W	C,K	IS V F-6 MCS	F	Intelsat	83
	A18.5°W	C,K	IS V-B	F	Intelsat	86
	C19°W	K,E	L-Sat	B	ESA	86
	N19°W	S,K	TDF-1, -2	B	France	85
	A19°W	K	LuxSat	B	Luxembourg	86
	A19°W	K	Helvasat	B	Switzerland	86
	C19°W	S,K	TV-Sat A3, A5	B	W. Germany	85
	A19°W	K	Sarit	B	Italy	86
	A20°W	X,K	GDL-4	B,F	Luxembourg	85
	C21.5°W	C,K	IS V Atl-5	F	Intelsat	86
	i21.5°W	C	IS IV-A F-4	F	Intelsat	77
	C21°W	L,C	IS MCS	M	Intelsat	u
	C23°W	L,C	Marecs Atl-2	M	Inmarsat	u
	A24°W	C	Prognoz 1	R	USSR	u
	A24.5°W	C,K	IS VI Atl-1	F	Intelsat	86
	C24.5°W	C,K	IS V-A Atl-1	F	Intelsat	84
	C24.5°W	L,C	IS V MCS Atl-D	M	Intelsat	u
	i24.5W	C,K	IS V F-3 Atl-1	F	Intelsat	82
	N25°W	U,S	Sirio-2B	F	France/SIR	87
	C25°W	U,L	Volna-1	M	USSR	u
	C25°W	K,E	Loutch-P1	F	USSR	u
	i25.7°W	C	Raduga 7	F	USSR	80
	i26°W	L,C	Marecs Atl-1	M	Inmarsat	81
	A27.5°W	C,K	IS VI Atl-2	F	Intelsat	87
	A27.5°W	C,K	IS V-A Atl-2	F	Intelsat	84
	C27.5°W	L,C	IS MCS Atl-B	M	Intelsat	u
	i27.5°W	C,K	IS V F-4	F	Intelsat	82
	A31°W	K	Unisat I	F,B	UK BTI	86
	A31°W	C,K	IS V Atl-6	F	Intelsat	u
	i31°W	C	IS IV-A F-1	F	Intelsat	76
	A34.5°W	C,K	IS V-A Atl-3	F	Intelsat	86
	i34.5°W	C,K	IS V F-2	F	Intelsat	80
	C34.5°W	L,C	IS MCS Atl-E	M	Intelsat	u
	b34.5°W	C,K	IS VI	F	Intelsat	88
	A37.5°W	K	Videosat-2	B	France	87
	A37.5°W	K	Orion	F	US-Orion	86
	A40.5°W	C,K	IS V-B	F	Intelsat	86
	A40.5°W	C,K	IS V-A Atl	F	Intelsat	86
	i41°W	L,K	TDRS-East	R	US-Spacecom	83
	f41°W	C	TDRS-East	F	US-SysGen	83
	f43°W	K	Cygnus II	F	US-Cygnus	88
	f45°W	K	Cygnus I	F	US-Cygnus	88
	f47°W	K	Orion	F	US-Orion	87
	A50°W	C,K	IS V-A Cont-2	F	Intelsat	86
	A50°W	C,K	IS V Cont-2	F	Intelsat	85
	A50°W	C,K	IS V-B	F	Intelsat	87
	C50°W	C	IS IV-A Atl-2	F	Intelsat	84
	C50°W	C	IS IV Atl-1	F	Intelsat	84
	A50°W	K	Orion	F	US-Orion	87
	i51°W	C	IS IV F-1	F	Intelsat	75
	A53°W	C	IS IV-A Atl-3	F	Intelsat	u
	A53°W	C,K	IS V-B	F	Intelsat	86
	A53°W	C,K	IS V-A Cont-1	F	Intelsat	85
	i53°W	L,C,K	IS V F-8 MCS	F,M	Intelsat	84
	A56°W°	K	USASat 13E	F	US-ISI	88
	b56°W	C	IS IV-A	F	Intelsat	87
	b56°W	C,K	IS V, V-A, V-B	F	Intelsat	87
	a57°W	C	Digisat 1A	F	US-Digi TI	87
	f57°W	C,K	Digisat 1A,1B	F	US-Digi TI	88
	f57°W	C,X,K	Pan Am Sat	F	US-PanAm SC	87
	A58°W	C	USASat 8-C	F	USA	87
	A58°W	K	USASat 13-D	F	US-ISI	88
	b60°W	C	IS IV-A	F	Intelsat	86
	b60°W	C,K	IS V, V-A, V-B	F	Intelsat	87
	f61°W	C	RCA Amer	F	US-RCA	89
	f61°W	K	Satcom K-4	F	US-RCA AM	89
	b61°W	L,K	TDRS-Cent	R	US-Spacecom	85
	f61°W	C	TDRS-Cent	F	US-SysGen	85
	f61.5°W	K	VSS PH II	B	US-Video Sat	u
	f61.5°W	K	SDT-1	B	US-Sat DT	87
	f62.5°W	C,K	Colsat (2 sats)	F	US-Col. C	86
	f63°W	C,K	RCA Amer	F	US-RCA	89
	C65°W	C	SBTS A-2	F	Brazil	85
	f65°W	C,K	RCA Amer	F	US-RCA	89
	A66°W	C	USASat 8A	F	USA	85
	a67°W	C	Satcom 6	F	US-RCA	86
	a69°W	C,K	Spacenet 2	F	US-GTE	84
	C70°W	C	SBTS A-1	F	Brazil	85
	A70°W	C	USASat 7C	F	USA-CGC	85
	i72°W	C	Satcom 2R	F	US-RCA	83
	f73°W	K	Galaxy	F	US-Hughes	87
	f73°W	K	MMC-1	F	US-Martin M	88
	f73°W	C,K	Ford Aero	F	US-Ford	88
	A74°W	C	USASat 7A	F	USA	85
	i74°W	C	Galaxy II	F	US-Hughes	83
	a75°W	K	Rainbow 3	F	US-Rainbow	87
	A75°W	C	Satcol-2	F	Colombia	u
	f75°W	K	MMC-2	F	US-Martin M	88
	f75°W	K	USAT III	F	US-USSI	89
	f75°W	K	USSSI	F	US-USBI	u
	f75°W	K	Galaxy	F	US-Hughes	89
	f75°W	C	Spotnet C2	F	US-NEX	87
	f75°W	K	Spotnet K2,4	F	US-NEX	87
	A75.4°	C	Satcol 1A/1B	F	Colombia	u
	i76°W	C	Comstar 1&2	F	US-ComGen	76
	a76°W	C	Telstar 302	F	US-AT&T	84
	a77°W	K	Satcom K-3	F	US-RCA	87
	i79.°W	C	Westar 2	F	US-WUTC	74
	A79°W	C,K	USASat 7D	F	USA	84
	f79°W	C	Westar-9	F	US-WUTC	89
	f79°W	K	RSI-1	F	US-Rainbow	86
	A81°W	C,K	Amer Sat	F	US-ASC	88
	A81.7°W	C	USASat 5C	F	USA	u
	C83°W	K	Usat 4	F	US-USSSI	88
	A83°W	K	ABCI	F	US-ABCI	86
	A83°W	C	STSC-1	F	Cuba	88
	i83°W	C	Satcom IV	F	US-RCA	82

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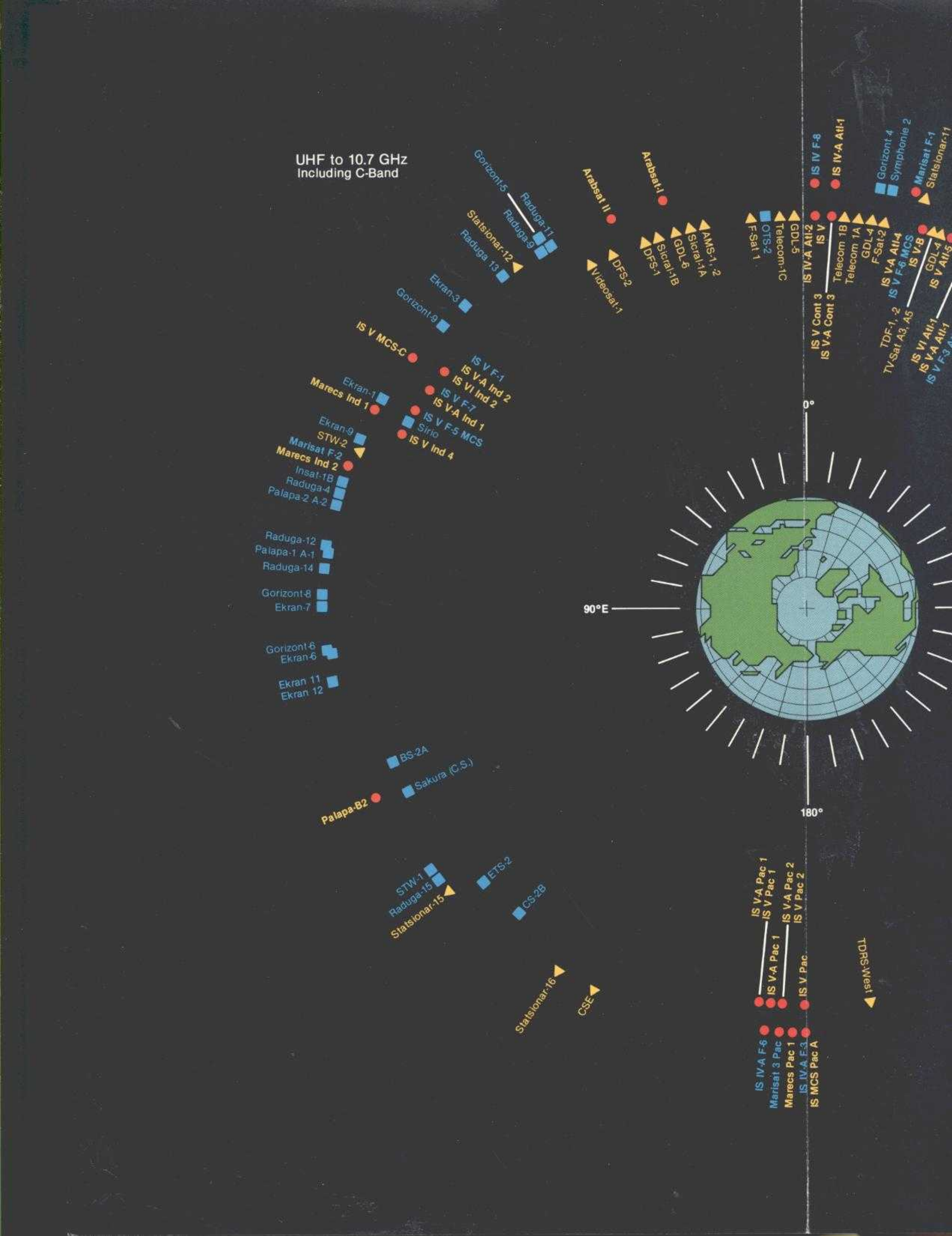
	A85°W	K	Usat 1	F	US-USSSI	86
	f85°W	K	Mobilsat 2	M	US-Mobilsat	88
	A86°W	C	Westar 6	F	US-WUTC	84
	A87°W	**C**	**Telstar-3B**	**F**	**US-AT&T**	**84**
	f87°W	C	Westar-7	F	US-WUTC	85
	f87°W	K	Westar-E	F	US-WUTC	88
	f87°W	K	Satcom	F	US-RCA	85
	f87°W	K	Westar-B	F	US-WUTC	88
	i87°W	**C**	**Comstar D-III**	**F**	**US-ComGen**	**78**
	A88.5°W	**C**	**Telstar 303**	**F**	**US-AT&T**	**85**
	A89°W	**K**	**SBS-4**	**F,B**	**US-SBS**	**84**
90°W	a91°W	C,K	Spacenet-III	F	US-GTE	85
	f91°W	E	Galaxy Ka-2	F	US-Hughes	88
	f91°W	K	Westar-A	F	US-WUTC	88
	91°W	C	Westar-III	F	US-WUTC	79
	f91°W	C	Westar-9	F	US-WUTC	89
	f93°W	**K**	**Comstar K-1**	**F**	**US-ComGen**	**87**
	f93°W	K	RSI-4	F	US-Rainbow	u
	f93°W	C,K	ASC 3	F	US-AmSater	89
	f93°W	C,K	Ford Aer 2	F	US-Ford	87
	f93°W	C	Equastar 2	F	US-Equit	88
	f93°W	K	Galaxy III	F	US-Hughes	88
	f93°W	**K**	**SBS-7**	**F**	**US-SBS**	**88**
	f93°W	K	Westar-C	F	US-WUTC	89
	f93°W	C	Westar-8	F	US-WUTC	88
	f93°W	E	Galaxy Ka-1	F	US-Hughes	89
	f93°W	E	Galaxy Ka-2	F	US-Hughes	89
	a93.5°W	C	Galaxy III	F	US-Hughes	84
	f95°W	**K**	**SBS-9**	**F**	**US-SBS**	**90**
	i95°W	**K**	**SBS-3**	**F**	**US-SBS**	**82**
	f95°W	K	RCA-DBS	B	US-RCA	87
	C95°W	K	USASat 6C	F	USA	84
	i96°W	C	Telstar 301	F	US-AT&T	83
	f97°W	**K**	**SBS-8**	**F**	**US-SBS**	**88**
	i97°W	**K**	**SBS-2**	**F**	**US-SBS**	**81**
	i99°W	C	Westar-IV	F	US-WUTC	82
	f99°W	K	Mobilsat	M	US-Mobilsat	u
	f99°W	**K**	**SBS-6**	**F**	**US-SBS**	**87**
	i100°W	**K**	**SBS-1**	**F**	**US-SBS**	**80**
	f101°W	C,K	Spacenet-3V	F	US-GTE	u
	f101°W	K	G-Star-III	F	US-GTE	u
	f101°W	**K**	**Comstar K-2**	**F**	**US-ComGen**	**88**
	f101°W	K	Fednet 1	F	US-Fed Ex	88
	f101°W	K	USSB (I of 2)	B	US-USSBCI	87
	f101°W	C,K	Ford Aero	F	US-Ford	87
	f101°W	K	Spotnet K1	F	US-NEX	87
	f101°W	K	Spotnet K3	F	US-NEX	88
	f101°W	C	Spotnet C1	F	US-NEX	88
	f101°W	**K**	**STC (1,2)**	**B**	**US-STC**	**87**
	f101°W	K	RCA Eastern	B	US-RCA Am	87
	f101°W	K	ACC	B	US-Adv. CC	87
	f101°W	K	DBS C-1	B	US-DBS	87
	f101°W	K	USSB	B	US-USSBCI	87
	f101°W	K	NEX DBS-1	B	US-NEX	88
	f101°W	K	NEX DBS-2	B	US-NEX	90
	f101°W	K	NCN	B	US-N.C.N.	87
	f101°W	K	SCS (1)	B	US-Space C.S.	87
	a103°W	K	G-Star-I	F	US-GTE	85
	i104.5°W	C	Anik D-1	F	Can-Telesat	82
	a105°W	K	G-Star-II	F	US-GTE SN	84
	i105°W	K	Anik C-2	F	Can-Telesat	82
	A106°W	K	USASat	F	USA	85
	A106.5°W	U,E	MSat	M,F	Canada	u
	b108°W	C	Anik D-2	F	Can-Telesat	84
	i109°W	C,K	Anik B-1	F	Can-Telesat	78
	A109°W	K	Telesat C-1	F	Can-Telesat	85
	f110°W	K	WU-DBS	B	US-WUTC	87
	f110°W	K	SSS	B	US-S.S.S.	87
	111.5°W	C	Anik E	F	Can-Telesat	90
	f112.5°W	K	Anik C-1	F	Can-Telesat	85
	A113.5°W	**C,K**	**Morelos**	**F**	**Mexico**	**85**
	i114°W	C	Anik A-3	F	Can-Telesat	75
	A116.5°W	**C,K**	**Morelos**	**F**	**Mexico**	**85**
	i117.5°W	K	Anik C-3	F	Can-Telesat	82
	f119°W	K	DBS-HS 1,2	B	US-Hughes	89
	f119°W	K	RCA Central	B	US-RCAAmeri	87
	f119°W	K	VSS	B	US-VSSI	87
	f119°W	K	NCN	B	US-NCNI	87
	f119°W	K	GraphSat	B	US-Graphic	87
	f119°W	K	W.U. DBS	B	US-WUTC	88
	i119°W	C	Satcom 2	F	US-RCA	76
	A120°W	K	USat 2	F	US-USSSI	87
	i120°W	C,K	Spacenet 1	F	US-GTE SN	84
	f122°W	C	Equastar 1	F	US-Equit.	87
	i122.5°W	C	Westar-5	F	US-WUTC	82
	A124°W	**K**	**SBS-5**	**F**	**US-SBS**	**86**
	a125°W	C	Telstar 304	F	US-AT&T	88
	f125°W	K	Mobilsat-1	M	US-Mobils	88
	A126°W	K	Satcom	F	US-RCA	87
	i127°W	**C**	**Comstar D-4**	**F**	**US-ComGen**	**81**
	f128°W	C,K	ASC 1 Sat	F	US-AmerSat	85
	130°W	K	USA Sat 10D	F	US-ABCI	86
	i131°W	C	Satcom-3R	F	US-RCA	81
	A132°W	K	RSI-2	F	US-Rainbow	86
	A132°W	C	Satcom-3	F	US-RCA	u
	i134°W	C	Galaxy 1	F	US-Hughes	83
	f134°W	K	Fednet 2	F	US-Fed Ex	88
	f134°W	K	Digisat 2	F	US-Dig C	89
	A136°W	**K**	**Amigo 1**	**B**	**Mexico**	**85**
	f137°W	C	Aurora III	F	US-Alascom	86
	f137°W	C	Galaxy-4	F	US-Hughes	91
	i138.3°W	C	Satcom-2	F	US-RCA	76
	i139°W	C	Satcom 1R,6	F	US-RCA	83
	f141°W	C	Aurora II	F	US-Alascom	89
	A141°W	C,K	Ilhuicahua-3	F	Mexico	u
	i143°W	C	Aurora 1	F	US-Alascom	82
	A145°W	C,K	Ilhuicahua-4	F	Mexico	u
	A146°W	**K**	**Amigo 2**	**B**	**Mexico**	**85**
	f147.5°W	C,K	Colsat	F	US-Col.C.	87
	f148°W	**K**	**STC-2**	**B**	**US-STC**	**87**
	f148°W	K	CBS-2	B	US-CBS	87
	f148°W	K	RCA Mtn.	B	US-RCA	87
	f148°W	K	USSB West	B	US-USSBCI	87
	f148°W	K	VSS-DBS	B	US-DVSI	87
	f148°W	K	ACC-DBS	B	US-Adv C.C	87
	f148°W	K	DBS C-2	B	US-DBSC	87
	f148°W	K	GraphSat	B	US-Graphic	87
	f148°W	K	NCN-DBS	B	US-Nat.C.N	87
	f148°W	K	WU-DBS	B	US-WUTC	88
	f157°W	K	SSS	B	US-Synd	87
	f157°W	K	WU-DBS	B	US-WUTC	88
	f157°W	K	RCA-Pacific	B	US-RCA	u
	N160°W	K	ESDRN	R	USSR	85
	f166°W	K	SCS 2	B	US-Space C.	87
	N168°W	C	Potok-3	F	USSR	u
	C170°W	U,L	Volna-7	M	USSR	u
	N170°W	C	Statsionar-10	F	USSR	u
	C170°W	K	Loutch-P4	F	USSR	u
	N171°W	S,K	TDRS-West	R	US-Spacecom	84
	f171°W	C	TDRS-West	F	US-SysGen	u
	f175°W	K	VSS PH II	B	US-Dominion VS	u



UHF to 10.7 GHz
Including C-Band
0°
90°E
180°
Gorizont-5
Raduga-11
Raduga-9
Statsionar-12
Raduga 13
Ekran-3
Gorizont-9
IS V MCS-C
Arabsat II
Arabsat-I
DFS-2
Videosat-1
DFS-1
Sicral-1B
GDL-6
Sicral-1A
AMS-1, 2
F-Sat 1
OTS-2
Telecom-1C
GDL-5
IS IV-A Atl-2
IS V
IS IV F-8
IS IV-A Atl-1
IS V Cont 3
IS V-A Cont 3
Telecom 1B
Telecom 1A
GDL-4
F-Sat-2
IS V-A Atl-4
IS V F-6 MCS
IS V-B
GDL-4
IS V Atl-5
Gorizont 4
Symphonie 2
Marisat F-1
Statsionar-11
TDF-1, -2
TV-Sat A3, A5
IS VI Atl-1
IS V-A Atl-1
IS V F-3
IS V F-1
IS V-A Ind 2
IS VI Ind 2
IS V F-7
IS V-A Ind 1
IS V F-5 MCS
Sirio
IS V Ind 4
Ekran-1
Marecs Ind 1
Ekran-9
STW-2
Marisat F-2
Marecs Ind 2
Insat-1B
Raduga-4
Palapa-2 A-2
Raduga-12
Palapa-1 A-1
Raduga-14
Gorizont-8
Ekran-7
Gorizont-6
Ekran-6
Ekran 11
Ekran 12
BS-2A
Sakura (C.S.)
Palapa-B2
STW-1
Raduga-15
Statsionar-15
ETS-2
CS-2B
Statsionar-16
CSE
IS V-A Pac 1
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IS V-A Pac 2
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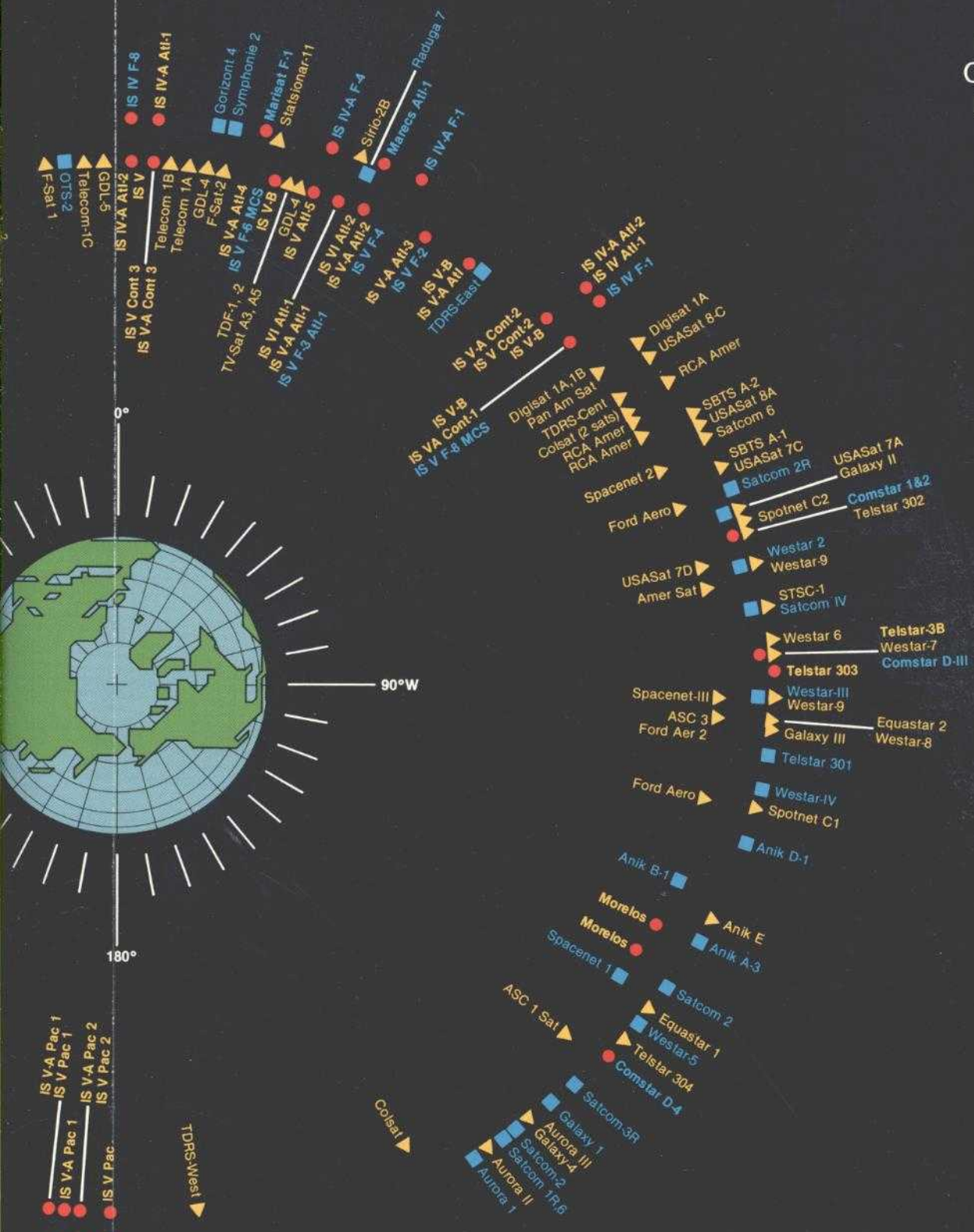
IS V-A Pac 1
IS V Pac
TDRS-West
IS IV-A F-6
Marisat 3 Pac
Marecs Pac 1
IS IV-A F-3
IS MCS Pac A

COMSAT

COMMUNICATIONS SATELLITE CORPORATION MAGA

Locations of Commerci Communications Satelli In Geosynchronous Orb Present and Planned as of June 25, 1984



- ● Satellites having COMSAT participation
- ▲ Name in yellow Planned
- ■ Name in blue In orbit 6/25/84

Satellites in inn
that cross over
ed are combina

Satellites with u
launch dates or
shown.

Technical Cons
Carl H. Schmitt
Comsat Genera

OMSAT

ATIONS SATELLITE CORPORATION MAGAZINE

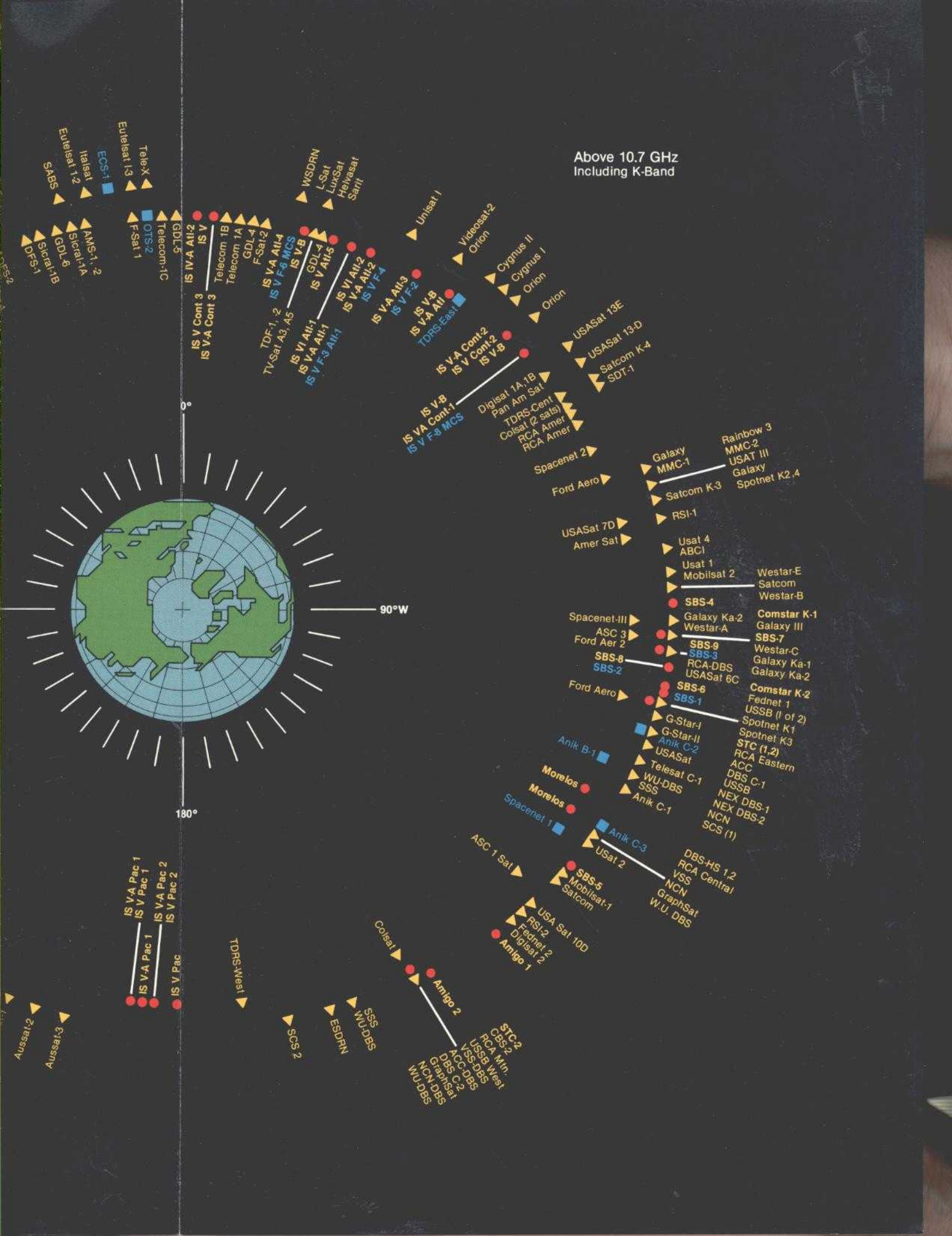
ations of Commercial
munications Satellites
Geosynchronous Orbit,
Present and Planned,
as of June 25, 1984

articipation

Satellites in inner circles have multiple bands that cross over 10.7 GHz demarcation. Included are combination C and K Band satellites.

Satellites with undetermined or unknown launch dates or with "b" status are not shown.

Technical Consultant:
Carl H. Schmitt
Comsat General Corporation

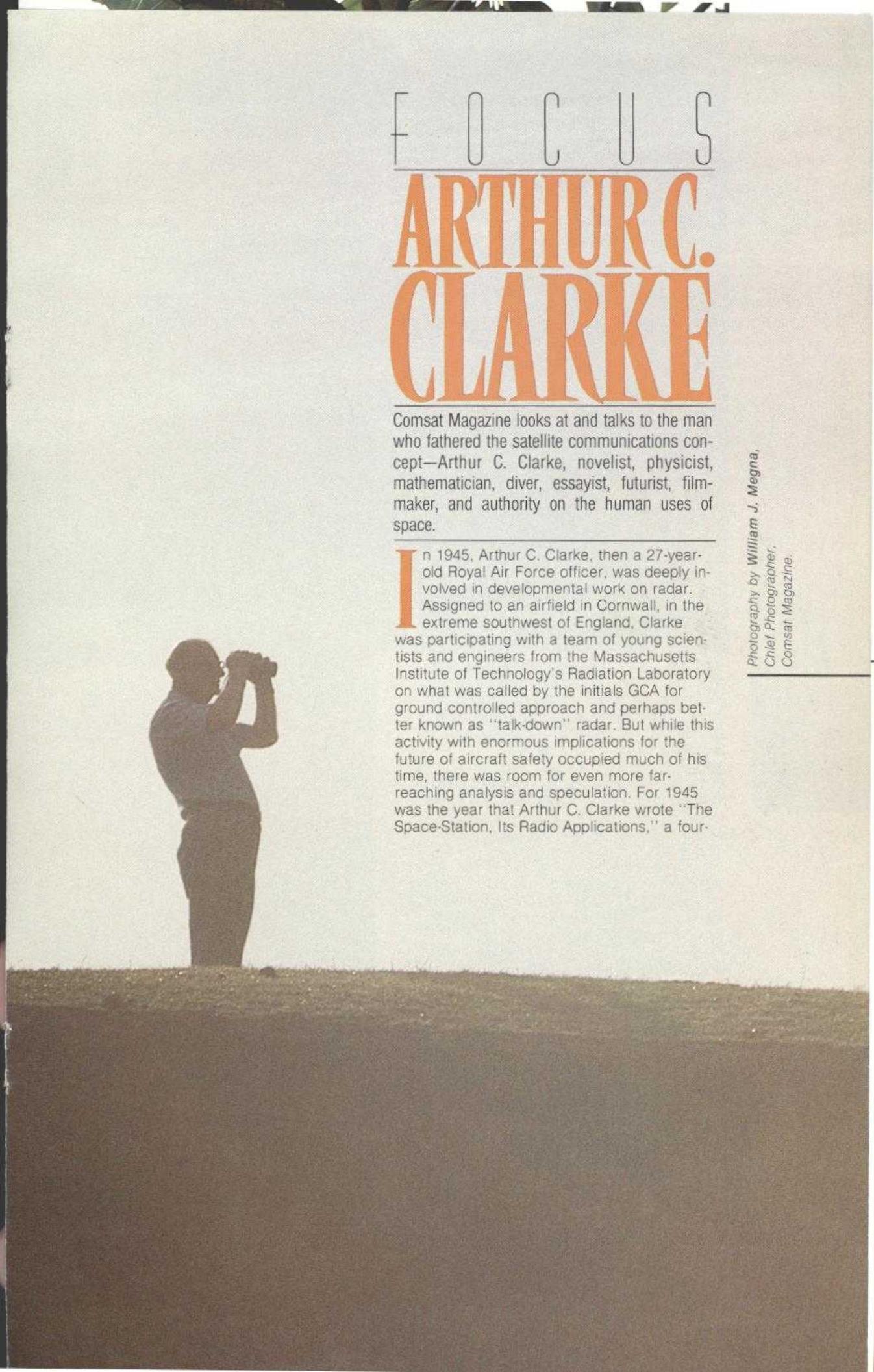

Above 10.7 GHz
Including K-Band
0°
90°W
180°
SABS
Eutelsat I-2
Italsat
ECS-1
Eutelsat I-3
Tele-X
F-Sat-1
OTS-2
Telecom-1C
GDL-5
IS IV-A Atl-2
IS V
Telecom 1B
Telecom 1A
GDL-4
F-Sat-2
WSDRN
L-Sat
LuxSat
Helvasat
Sarit
IS V-A Atl-4
IS V F-6 MCS
IS V-B
GDL-4
IS V Atl-5
Unisat I
Videosat-2
Orion
IS V Cont 3
IS V-A Cont 3
TDF-1, -2
TV-Sat A3, A5
IS VI Atl-1
IS V-A Atl-1
IS V F-3 Atl-1
IS VI Atl-2
IS V-A Atl-2
IS V F-4
IS V-A Atl-3
IS V F-2
IS V-B
IS V-A Atl
TDRS-East
Cygnus II
Cygnus I
Orion
Orion
IS V-A Cont-2
IS V Cont-2
IS V-B
IS V-B
IS VA Cont-1
IS V F-8 MCS
Digisat 1A 1B
Pan Am Sat
TDRS-Cent
Colsat (2 sats)
RCA Amer
RCA Amer
USASat 13E
USASat 13-D
Satcom K-4
SDT-1
Spacenet 2
Ford Aero
Galaxy
MMC-1
Satcom K-3
RSI-1
Rainbow 3
MMC-2
USAT III
Galaxy
Spotnet K2,4
USASat 7D
Amer Sat
Usat 4
ABCI
Usat 1
Mobilsat 2
Westar-E
Satcom
Westar-B
SBS-4
Spacenet-III
ASC 3
Ford Aer 2
Galaxy Ka-2
Westar-A
Comstar K-1
Galaxy III
SBS-7
Westar-C
Galaxy Ka-1
Galaxy Ka-2
SBS-9
SBS-3
RCA-DBS
USASat 6C
SBS-8
SBS-2
Ford Aero
SBS-6
SBS-1
Comstar K-2
Fednet 1
USSB (I of 2)
Spotnet K1
Spotnet K3
STC (1,2)
RCA Eastern
ACC
DBS C-1
USSB
NEX DBS-1
NEX DBS-2
NCN
SCS (1)
G-Star-I
G-Star-II
Anik C-2
USASat
Telesat C-1
WU-DBS
SSS
Anik C-1
Anik B-1
Morelos
Morelos
Spacenet 1
Anik C-3
USat 2
DBS-HS 1,2
RCA Central
VSS
NCN
GraphSat
W.U. DBS
ASC 1 Sat
SBS-5
Mobilsat-1
Satcom
USA Sat 10D
RSI-2
Fednet 2
Digisat 2
Amigo 1
Colsat
Amigo 2
STC-2
CBS-2
RCA Min.
USSB West
VSS-DBS
ACC-DBS
DBS C-2
GraphSat
NCN-DBS
WU-DBS
IS V-A Pac 1
IS V Pac 1
IS V-A Pac 2
IS V Pac 2
IS V-A Pac 1
IS V Pac
TDRS-West
SCS 2
ESDRN
SSS
WU-DBS
Aussat-2
Aussat-3

FOCUS

ARTHUR C. CLARKE

Comsat Magazine looks at and talks to the man who fathered the satellite communications concept—Arthur C. Clarke, novelist, physicist, mathematician, diver, essayist, futurist, filmmaker, and authority on the human uses of space.

In 1945, Arthur C. Clarke, then a 27-year-old Royal Air Force officer, was deeply involved in developmental work on radar. Assigned to an airfield in Cornwall, in the extreme southwest of England, Clarke was participating with a team of young scientists and engineers from the Massachusetts Institute of Technology's Radiation Laboratory on what was called by the initials GCA for ground controlled approach and perhaps better known as "talk-down" radar. But while this activity with enormous implications for the future of aircraft safety occupied much of his time, there was room for even more far-reaching analysis and speculation. For 1945 was the year that Arthur C. Clarke wrote "The Space-Station, Its Radio Applications," a four-



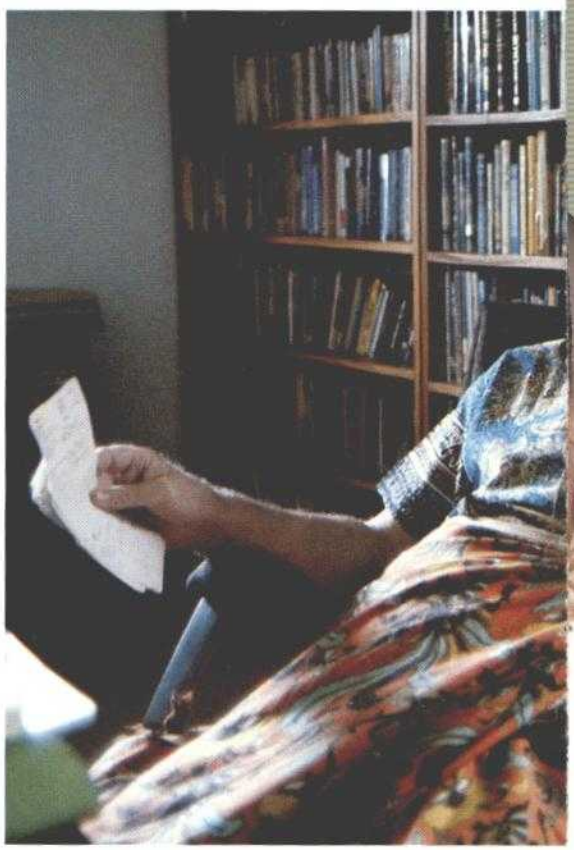
Photography by ***William J. Megna****, Chief Photographer, Comsat Magazine.*

page single-spaced article complete with illustrations, an article published by *Wireless World*, now *Electronics and Wireless World*, in October of the same year.

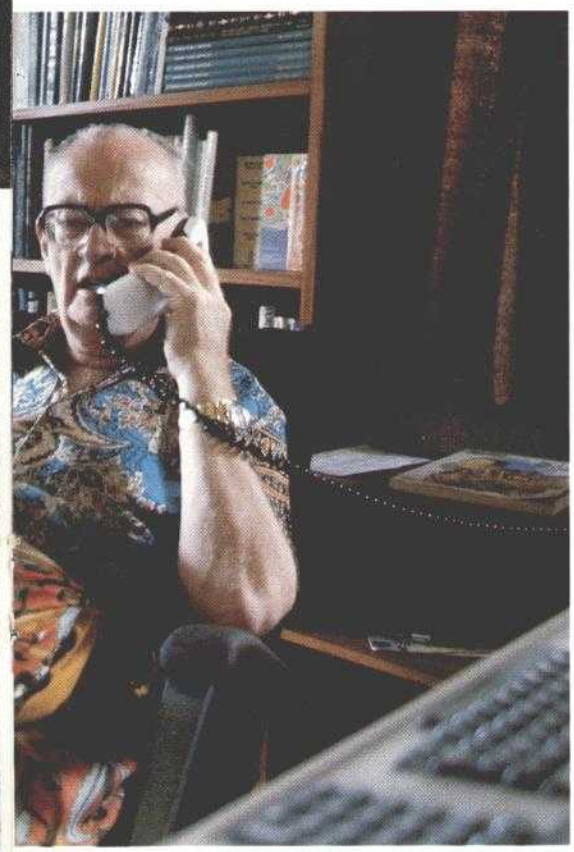
It would be difficult to overstate the significance of the achievement that is "The Space-Station, Its Radio Applications" and of Arthur C. Clarke to the development and use of the communications satellite and, indeed, to the whole subject of the human uses of space. The achievement grows in magnitude when we remember that in 1945 musings about the use of space were restricted to people sometimes dismissed as wild-eyed and peculiar, and, sadly, the first practical use of the rocket known to the people of the day was as a vehicle to rain down bombs on English cities. Yet in "The Space-Station, Its Radio Applications," we have the clear, calm voice of the scientist speaking as if the launch via rockets of communications satellites—or telecommunications relay space-stations—and their stationing in geosynchronous orbit was not only practical, but probable. No work of the fuzzy-headed dreamer is this carefully reasoned, clearly presented piece of prose. Visionary it is, one of the most visionary pieces ever written, but it is the visionary under tight control of a man steeped in scientific principle and engineering method, a man who would soon go off and study physics and pure and applied mathematics at King's College in London and win first class honors in the process.

From "The Space-Station, Its Radio Applications," Arthur C. Clarke, born in Minehead, Somerset, England, in 1917, was to go on and broaden his writing career to a degree that clearly marks him as a modern Renaissance man. Not just space but the sea as well became his subject, and some of his more than 50 books pertain to diving expeditions he was part of off Australia and in the Indian Ocean. To the public, he is best known as the author of such science fiction successes as *2001, A Space Odyssey* (for which, initially, he wrote the screenplay in collaboration with Stanley Kubrick), and *2010, Odyssey two*, and one of his novels—*Rendezvous With Rama*—was the winner of three separate awards. The public also knows Arthur C. Clarke as an on-camera commentator with Walter Cronkite on the CBS television network during the Apollo missions and as the writer of and host of the television series *Arthur C. Clarke's Mysterious World*. In recent years, Clarke has been a sometime public speaker on and writer of essays about the major issues facing humankind, in particular the threat of nuclear weapons.

For **Comsat** and for **Intelsat**, the 1945 article in *Wireless World* must remain his single most important work, of course. For "The Space-Station, Its Radio Applications" is



Previous Page, *Arthur C. Clarke, standing on wall that surrounds the city of Galle in southern Sri Lanka, uses binoculars to sight approaching monsoon.* ***Below,*** *plaque outside Clarke's house in Sri Lanka. He is co-owner of Underwater Safaris, Scuba touring enterprise.*



Top Left, *The backyard of Arthur C. Clarke's house in Colombo, Sri Lanka, revealing his own 16 foot satellite dish antenna.* **Below Left,** *Clarke in the office of his house in Colombo. Kaypro computer linked through modem to antenna gives Clarke communications access to the world*

the technical foundation upon which both organizations are built (and, incidentally, the specific intellectual progenitor of the direct broadcasting from satellite (DBS) television service that **Comsat** is offering in conjunction with two other principal partners.) Given Arthur C. Clarke's importance to us, an article about him in **Comsat Magazine** is long, long overdue. In defense of our tardiness, we plead distance. Yes, the communications satellite has brought the people of the world closer together, but it is one thing to carry on a telephone conversation with someone on the other side of the world, even when he is 10 hours ahead of you, and another thing to interview him (and photograph him) for a magazine article. Arthur C. Clarke, you see, is a full-time resident of Sri Lanka, formerly called Ceylon, an island nation off the southeast coast of India.

Our first opportunity—a terribly brief one—to have at Arthur C. Clarke occurred in May. He was in Washington to give a lecture and to make a cameo appearance in the movie version of *2010*, being directed for MGM by Peter Hyams. (Hyams also wrote the screenplay.) For about three quarters of an hour, most of it spent in the backseat of a car proceeding from the airport—a little battery powered tape recorder operating between us—we fired questions at the man. Then at a

location near the White House, William Megna, Chief Photographer, photographed him being filmed by MGM in his cameo role. That was that. The next thing we knew he was on his way back to Sri Lanka. Tantalized, we decided to follow.

And follow we did. For a week in late June, Arthur C. Clarke rarely eluded William Megna's camera lens, and there was also time for a more relaxed, more fully developed tape recorded interview. In Sri Lanka, we found Clarke once again involved with the film business, only this time the filming was for a new television series—*Arthur C. Clarke's World of Strange Powers*—being produced by Yorkshire Television of Leeds, England.

Through the words that follow and through the photographs used throughout, we attempt to provide some insight into this modern Renaissance man called Arthur C. Clarke—novelist, physicist, mathematician, diver, film-maker, spokesman for the importance of communications to the developing world, essayist, futurist, authority on the human uses of space, and, in particular, the father of the satellite communications concept. In the question and answer interview—a blending of the taped interviews done in Washington and in Sri Lanka—Clarke covers subjects as diverse as his hopes for the future of both **Comsat** and **Intelsat**, current trends in telecommunications, life in Sri Lanka, the threat of offensive militarization of space, the peaceful uses of space, and his philosophy of science fiction writing.

These words of introduction could not be complete without an expression of our deepest thanks to Arthur C. Clarke for the time he took from exceedingly busy schedules in both Washington and Sri Lanka to give to us.

Stephen A. Saft

Galle on the southern coast of Sri Lanka, as photographed from a section of wall surrounding the city. Galle was conquered by the Portuguese in the 16th Century, seized 53 years later by the Dutch, and, over a century later, yielded to the British.

Q: *Comsat is now 21 years old, and Intelsat is just celebrating its 20th Anniversary. Have you been surprised at all at the way these organizations have developed?*

CLARKE: I have been astonished by the speed. It's more than anybody could have anticipated. When you look back, of course, what happened should appear obvious. The first transatlantic telephone cable should have taught us a lesson. As soon as you get a good service—and there is a quantum jump in performance, accessibility and reliability—then everybody wants it. They can't live without it.

Q: *But in the United States right now the electronics and communications industries are experiencing a lot of uncertainty. Do you think the public—in the United States and perhaps elsewhere—is becoming less interested in electronics and communications than it was?*

CLARKE: I have no reason to suppose that. In fact, I am sure that as more facilities become available, they are going to be snapped up. I'm thinking of cellular radio. I'm sure in a decade every car will have a two-way radio, that is, a telephone, just as today every car has a conventional radio. The public will just take it for granted. And, of course, on the computer side, as electronic mail comes in, it is going to be taken as much for granted as the telephone has been for the last century.

Q: *So, as you see things, the enthusiasm is still there?*

CLARKE: Well, I don't think you can expect to find enthusiasm in the general public about anything, except maybe baseball and football. "Acceptance" is

perhaps the right word. Who would have ever dreamed that there would be acceptance of the home computer, and look at that. That is beyond the wildest dreams of anybody. And look at the way that transistor radios have spread all over the whole world, and that's only just the beginning. When we have solar powered radios so people won't be dependent on batteries, we'll see another wave of popularity for the radio.

Q: *As the satellite communications technology has matured, more and more companies and organizations have sought to enter the business, and now in the United States a number of companies are seeking to provide international communications services via satellite. Comsat has argued that the existence of additional satellite systems offering international service in the Atlantic Ocean region would hurt Intelsat. This is a sensitive issue, but I wonder if you would care to comment about it.*
CLARKE: I have very ambiguous feelings about it. Competition is good. Often it does improve service. That was the idea behind breaking up the Bell System. People all gallop off in different directions. They all do their thing. Some of them fail. Some of them succeed, but on the whole the public gets better and more service at less cost. I will tell you what I am worried about, and this is a point that Abbott Washburn (former FCC commissioner) has made. The developing countries might be caught in the squeeze, in fact. There may not be money available to support the thin route services, which are of vital importance to countries which can't afford anything else.

Intelsat itself is a marvelous achievement. It is possibly the most successful—perhaps I should say the only successful—international enterprise on a global scale in which you have more than a 100 countries cooperating, even countries that hate each other's guts, even countries which have been at war with each other from time to time. I've often said that I regard **Intelsat** as the precursor of the world state. The world state may even evolve out of **Intelsat**. As we know, **Intelsat** is being nibbled at around the edges by hopeful free enterprisers, but I hope that—indeed, expect that—**Intelsat**'s value to the world will remain so obvious that it will not be jeopardized, and it will go from strength to strength.

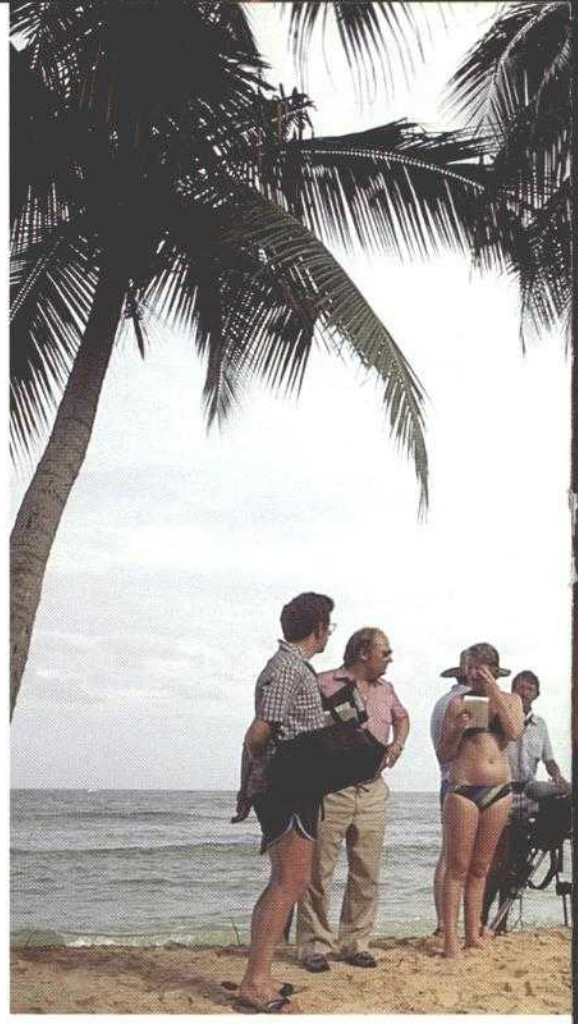
Q: *In general terms, what good has satellite communications been for the developing world?*
CLARKE: It has improved the efficiency of all international commerce enormously. Commerce is vital both on the business side and also for tourism, one of the key and expanding businesses in the developing world. Tourists won't go to places if they cannot call home. A few years ago, it was impossible to make a phone call from Sri Lanka. Now you can get through from any good hotel and many private houses as quickly as you can dial the number. That is an incalculable advantage. Looking a little bit further ahead, of course, one sees that the whole global television network is developing. Very soon, tourists won't travel unless they can see their favorite TV programs. That may sound a bit ironic—you know tourists taking their home culture with them—but it will be quite a consideration for many.

Q: *Speaking of the developing world, I want to ask you specifically about Sri Lanka. Sri Lanka is considered part of the developing world. You've lived in the country for many years. It strikes me as a little paradoxical that someone who spends so much of his intellectual life*

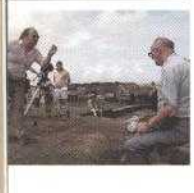
thinking about and writing about the future should spend most of his time in a place that is not as advanced as other parts of the world. Does living in both the developing world and the world of the future ever cause you any problems?
CLARKE: On the contrary, I'd say it helps me. Besides, the whole world is developing. There's not that much difference between the developed and the lesser developed world at the moment. They are both at a very primitive stage when compared with the possibilities the future holds. In the last 10 years, I've seen the communications revolution hit this country, and that's continuing around me right now. It's fascinating being here watching the frontier move before your eyes. I get a great stimulus from living here, and it's certainly no handicap, because I am able to distance myself from all of the hustle and bustle of the so-called developed world, see what's going on, and then come back here and recharge myself.

Q: *When did you come to settle in Sri Lanka, and how did it come about?*
CLARKE: I have written a whole book on that, *The View From Serendip*. I came here because of my interest in diving. I came here in 1956 to do an underwater book, *The Reefs of Taprobane*, long out of print. During the course of writing that book, I just fell in love with the country, made many friends and settled down. For a long time I was unable to maintain my permanent residence here because of the income tax situation. Now that's been sorted out. I can remain here permanently. I very seldom leave except for some special thing like the premiere of *2010* or some prestigious lecture. Or for cruising. I love ships, and every year, on average, I join the S.S. Universe, which sails around the world with four or five hundred college kids and their professors. I like talking to them, playing table tennis, reading, and lying in the sun. Shortly I'm going to join them in Hong Kong and sail back to Sri Lanka. In 1986, I'm joining a cruise to the Caribbean to view Halley's Comet.

Q: *According to what list of priorities would you like to see the space program in the United States proceed in the next 20 years?*
CLARKE: That's a $64 billion question, perhaps, a $640 billion question. You have to build on the base that you've already established, which means, of course, exploiting the Space Shuttle,



Below, *Simon Welfare, Executive Producer, Yorkshire Television, directs Clarke in scene for new television series "Arthur C. Clarke's World of Strange Powers" at Galle in Sri Lanka. Yorkshire Television, based in Leeds, England, also produced previous Clarke television series.*



stretching its uses as far as possible and developing upper stages to reach geosynchronous orbit. You must exploit in every possible way the technology that has been developed at such great expense and, hopefully, beat some of the swords into plowshares at the same time.

Q: *Are you glad to see the development of a permanent manned earth station as a NASA priority?*
CLARKE: Yes, but I'm torn. The exploration of the planets is a fascinating thing to me, and that is going to be done through space missions like Galileo. Even Galileo could be launched more conveniently after checkouts in space on a manned space platform. I'm quite sure that in a few decades all these arguments about manned versus unmanned space enterprises are just going to look silly. There is a demand for mixed approaches in the use of space. We will be very glad when we have established manned space facilities of all kinds.

Q: *Do you think there is promise in space manufacturing, the same kind of*

Yorkshire Television production company with Clarke on beach at Unawatuna, near Weligama, on the southern coast of Sri Lanka. Yorkshire is shooting new television series called "Arthur C. Clarke's World of Strange Powers."

promise we have seen realized in satellite communications?
CLARKE: I'm sure there is. I'm also sure that much has been oversold in this regard. I'm tired of hearing about perfect ball bearings. I think space manufacturing is going to be an enormous industry in the future, but the big payoffs will be in things we haven't thought of yet. An analogy which I have used many times is this: If we were intelligent fish, and we just discovered the dry land—the air and all that—and we were trying to think of ways of exploiting our new discovery and developing it, we might think of all sorts of ingenious technologies, but something we would never think of is fire. It is the same situation for us in space. Once we are using space in permanent ways, we will see the need for technologies that are beyond us at present. There may be all sorts of machines that can only be assembled under zero gravity.

Q: *What are your thoughts about some of the new technologies that are based on the communications satellite? One concept that we at Comsat feel quite strongly about is direct broadcasting of television from space.*
CLARKE: I originally said that that was the only way to go. I never dreamed the television industry would build these enormous ground-network systems. Although I thought that the communications satellite was a long way off—at the end of the century, really—I didn't think that the demand for television on a wide scale would be so enormous that the industry would network continents internally. That was a surprise.

The one thing that has surprised me most is the development of long distance fiber optics. I heard the other day that we may see continent-wide fiber optics without repeaters. Right now we're seeing the development of cable that only needs a repeater every 100 kilometers. That would have struck everyone as incredible 10 years ago. Obviously, this may have profound consequences for your point-to-point circuits. Of course, it won't affect what I think is going to be Comsat's main business—mobile and disbursed communications.

Q: *You see mobile communications then as a major business for Comsat?*
CLARKE: I think it will be the main Comsat business one day. Certainly, for the high density routes—New York to London and the other routes like it—fiber optic cable will be the main carrier.

Q: *In this growing mobile communications environment, do you see the advent of the Dick Tracy wrist radiotelephone?*
CLARKE: Very much so, but before that we'll see the widespread use of car telephones, telephones for vehicles of all kinds. And only satellites can provide global mobile services. That is their strength, and I can't see any replacement for them.

Q: *You've been a strong proponent of international monitoring satellites as an instrument of world peace. What else needs to be done to ensure that the super powers don't start firing nuclear warheads at each other?*
CLARKE: I wouldn't say that I'm a strong advocate of the international monitoring satellite—the French proposal—which I have called Peace-Sat, but I do strongly advocate it be looked at very carefully. I can see a lot of problems but also a lot of promise. I came across a phrase in this context that seems to be a very useful one. I don't know whose it is, but I'd like to compliment whoever first thought of it. The phrase is "peace through truth." That's one of the problems of our present society,

that we don't know the facts, and, therefore, we're scared of possibilities. The reconnaissance satellites that already exist have been a step in the right direction. They did establish peace through truth. As President Johnson has said, which I quoted in my "War and Peace in the Space Age" essay, before there were reconnaissance satellites, the United States harbored fears of the Soviet Union that were unnecessary. The United States was preparing to build weapons systems as a result that were unnecessary. The more truth we have on both sides the more stable the world situation will be.

We must try to prevent any offensive militarization of space and continue only with the defensive militarization of space. This may be a bit confusing because now there is talk of defensive/offensive space systems. I am sure someone will demonstrate a system that will shoot down an ICBM at launch, if you have an army of technicians to run it. I should think that you could get a fairly high rate of success against an ICBM system, maybe more than 50 percent, maybe even 90 percent. If one in a hundred gets through, that's still too much. At the same time, one has to keep a study project going in this area in case there is a breakthrough that might make it more feasible, but I think it is very unlikely that

Yorkshire Television films Clarke in graveyard of Dutch Church in Galle, built in 1754. Segment being filmed deals with the spirits of Dutch children who died in great numbers during days of early Dutch settlement in Sri Lanka.

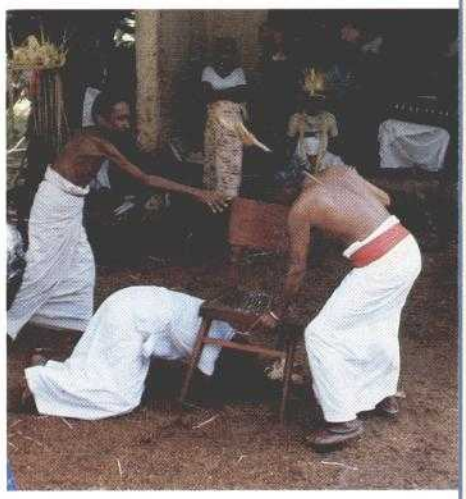
it will ever be economically or technically possible to have an effective antimissile defense.

Q: *You're a scientist and engineer, and you've contributed much to scientific and technical literature, but you are probably best known to the general public as a writer of science fiction, specifically, 2001, A Space Odyssey; and 2010, odyssey two. What purpose does the writer of science fiction serve in the world? Is he just an entertainer or does he do more?*

CLARKE: There is nothing wrong with being just an entertainer, because we need entertainment. Much entertainment can also provide a great deal of education, but I think the science fiction writer, besides doing that, often serves another very useful purpose. He's an early warning system. Classic examples are George Orwell, whose year we are celebrating—if "celebrating" is the right word—and Aldous Huxley and his Brave New World. Science fiction writing, when it is done competently and responsibly, has considerable cultural value.

Q: *Is it possible for you to summarize for us what your creed is as a science fiction writer?*

CLARKE: Well, the most important thing is not to cheat the reader. Everything you write should be possible, if you are



*Scenes from Sri Lankan dehexing ceremony filmed by Yorkshire Television for series "Arthur C. Clarke's World of Strange Powers". **Top,** Chief dehexer; **Bottom Left,** Ridding house of demons through fire; **Bottom Right,** Woman from whom demons are being exorcized goes under a chair.*

Right, *Clarke speaks with Roy Scheider, star of film version of "2010, odyssey two," during filming of scene outside White House in Washington, D.C.*
Below, *Clarke wears jacket worn by astronauts in "2010" while answering questions from Editor of Comsat Magazine.*

writing science fiction. If you are writing fantasy, then, of course, the rules are different. I enjoy fantasy too and have tried it once or twice. In science fiction, what you are writing must be possible. It needn't be probable, but it must be possible.

Q: *In other words, science fiction must be realistic?*
CLARKE: Oh yes, science fiction must be based on reality. Otherwise it's pure fantasy. Of course, as science expands, you have more reality to base your science fiction on. The good example of that is *odyssey two*, which I could not have written until after the Voyager mission. That made it possible, and that is why I can't even think about *odyssey three*, assuming I ever do, until after the Galileo mission.

Q: *The Galileo mission will do what?*
CLARKE: It leaves in 1986 and arrives in the Jovian system in August 1988. It will drop a probe riding at 40,000 miles per hour into Jupiter's atmosphere. Then it will crank around all the moons of Jupiter for months and months, unlike Voyager, which just zapped through.

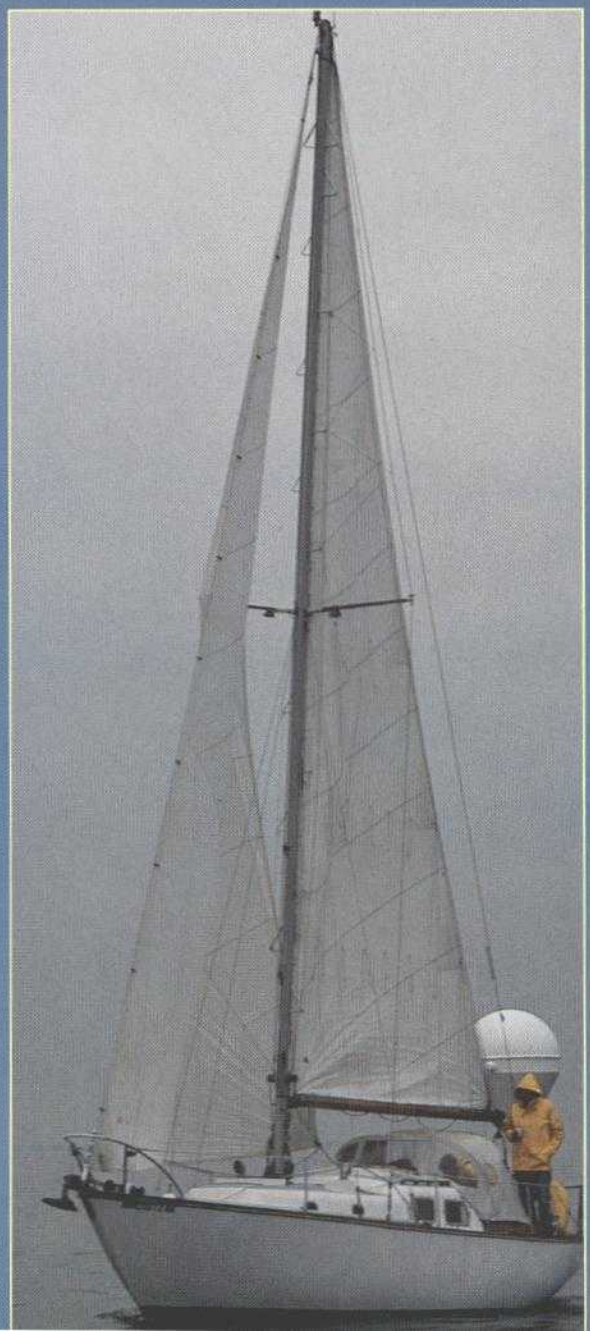
Q: *The mind plays such an important role in 2010, odyssey two. The thought struck me that perhaps one of the things you were saying was that the ultimate way to travel around the Solar System is via the mind, in other words, the imagination. Was this thought in your own mind when you were writing the book?*
CLARKE: Any writing, at least the way I do it, is a voyage of exploration. I don't know what I'm going to find on the way. I have a general idea. Otherwise, I wouldn't start writing. I know what characters I have, what the background is, and have some sort of plot in mind. Nevertheless, I get little surprises along the way and discover things I had not known or expected when I began to write. Something you had written way upstream suddenly has a totally different or far greater importance and significance in a way you never imagined. In fact, the whole feeling of a book can change as a result of some unexpected development. In one case, the whole feeling of the book changed with the very last word, in *Rendezvous With Rama*. The last words, which I had never thought of before, changed the texture of the whole novel.

FROM TELESYSTEMS

Satellite communications for the smaller boat

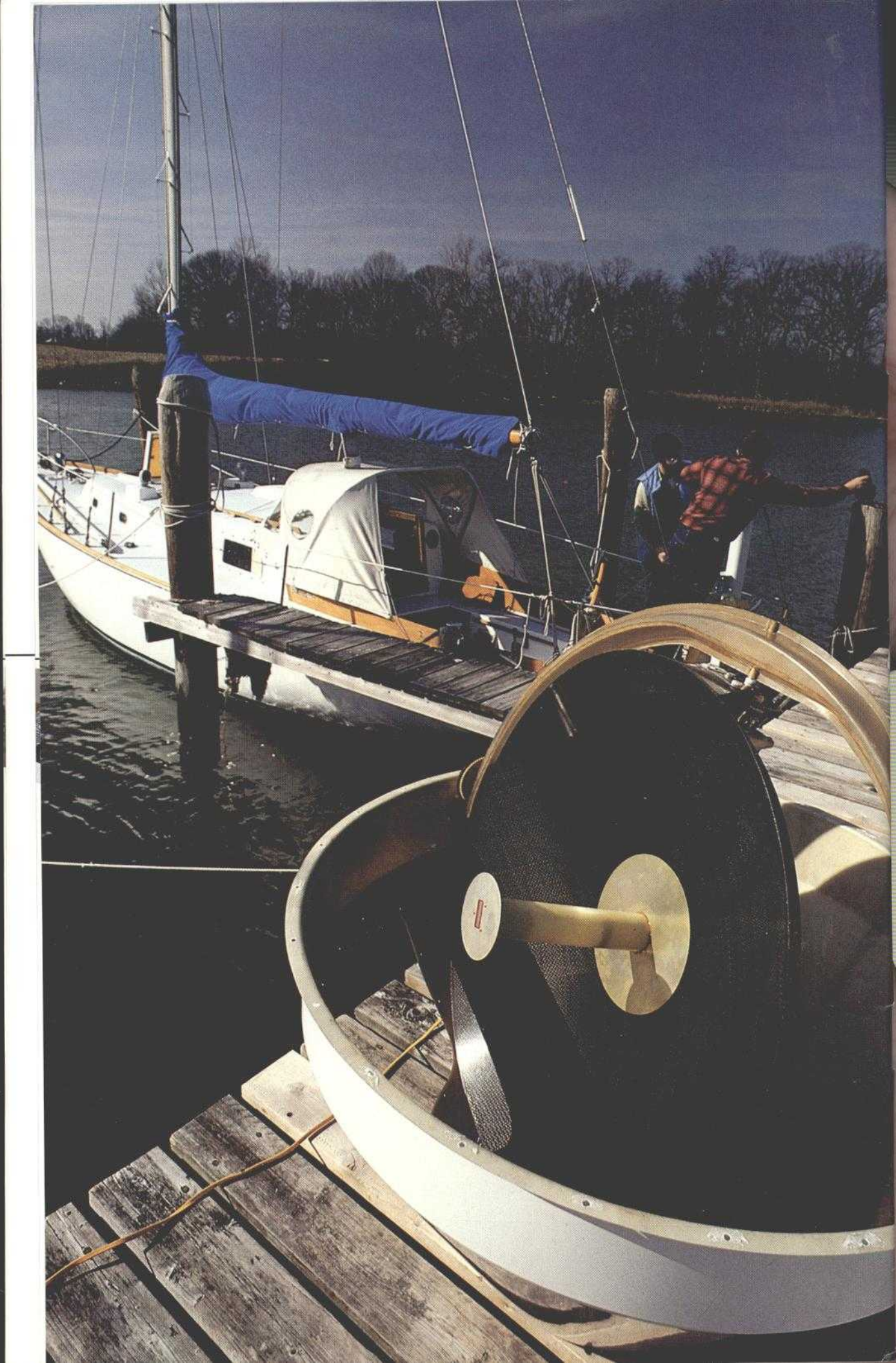
Comsat TeleSystems, Inc., has received Inmarsat Type Approval for its MCS-9100 ship earth station. According to a spokesperson for **TeleSystems**, "The MCS-9100 is the smallest, lightest and most technologically advanced terminal available."

The MCS-9100 radome and antenna assembly weighs less than 50 pounds and is 42 inches in height. "This dramatic reduction in size and weight over currently available terminals allows



Photography by ***William J. Megna****, Chief Photographer, Comsat Magazine.*

Sea trials for TeleSystems' new light-weight, down-sized ship earth station took place on Chesapeake Bay aboard the Esperance, 35-foot sloop owned by James H. Durham, Director of Engineering Services, Mobile Satellite Systems. Above-decks portion of earth station is mounted on stern of boat.



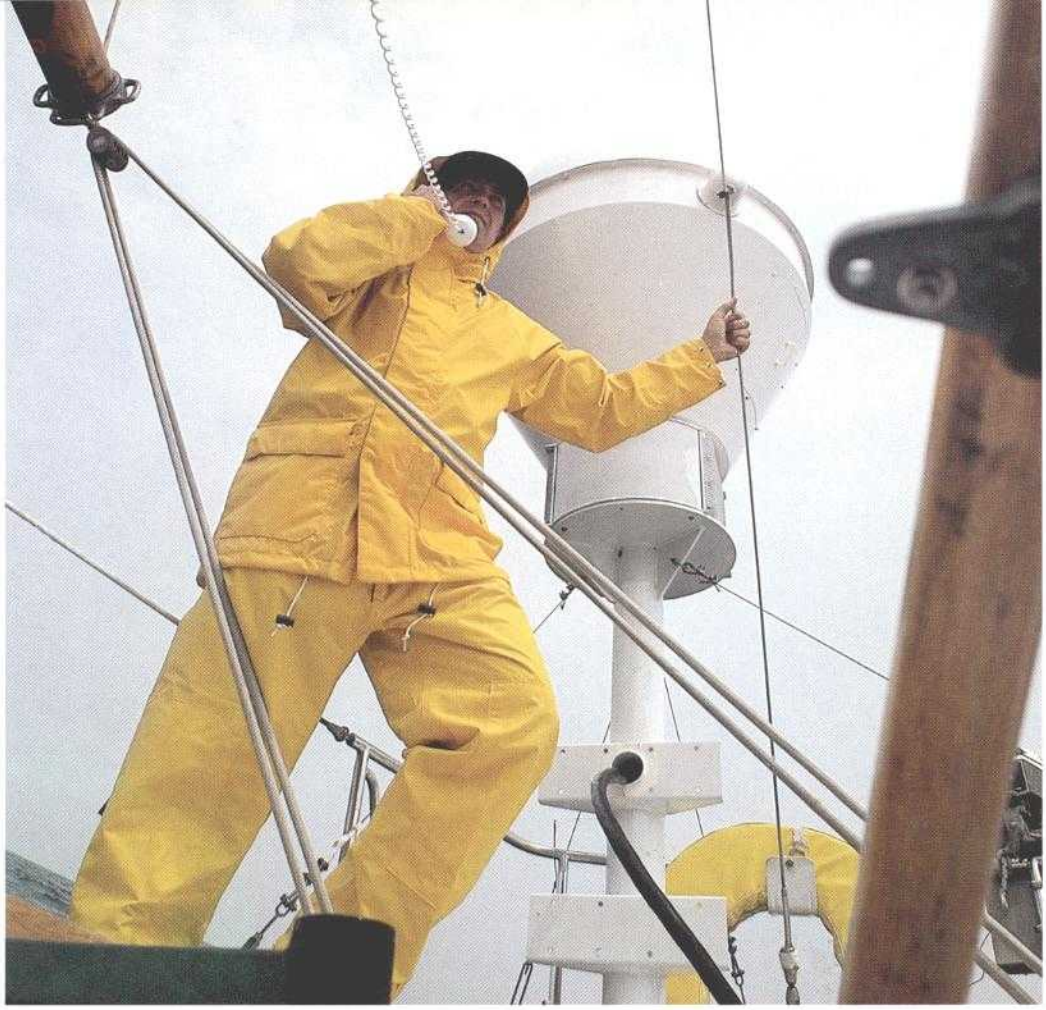
Facing Page, *Above-decks assembly of new TeleSystems ship earth station taken apart to show graphite composite reflector. In the background, the Esperance.* ***Left,*** *TeleSystems' Ernest Peixotto shows just how lightweight above-decks assembly is.*

private yachts, fishing boats, and smaller vessels to join the larger craft already reaping the benefits of satellite communications by having on-board Telex, telephone and facsimile communications," the spokesperson stated. "In addition, the unique design of the MCS-9100 makes it more reliable, easier to install, and less expensive to transport than other terminals."

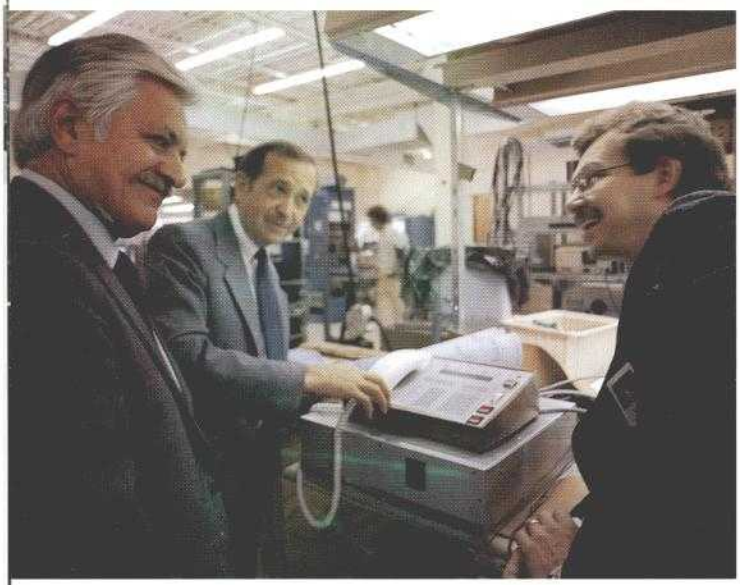
Commenting on the unit's Inmarsat Type Acceptance, **TeleSystems**' Vice President of Mobile Satellite Systems, John Pientka, stated, "The MCS-9100 performed flawlessly during **Inmarsat**'s rigorous series of tests." The MCS-9100 is an exciting example of our ability to meet the needs of the market. In the coming months, TeleSystems will introduce other innovative developments specifically tailored to individual market segments."

Designed to meet or exceed all Inmarsat specifications, the TeleSystems MCS-9100 is a light-weight, down-sized version of its predecessor, the MCS-9000. The larger and heavier gyro stabilized antenna assembly of the MCS-9000 has been replaced by a smaller 90 centimeter graphite composite reflector. The antenna is gimbal mounted and microprocessor controlled, which eliminates problems associated with cable twists and rewrap. The system's unique hardware/software gyro interface allows it to accept yaw and turning rates in excess of 30 degrees per second, ensuring continuous satellite tracking even in the heaviest seas.

The MCS-9100 was specifically designed for ease of installation, operation, and maintenance. The system can be carried on board by the installers and be operational within a few hours. Once installed, the below decks control panel is organized to provide "friendly" access



Even at sea, help can be just a phone call away. If you're equipped with TeleSystems ship earth station. **Below,** *Small below-decks ship earth station prototype and, from left, TeleSystems' Constantine Prisekin, James Durham, and John M. Pientka, Vice President, Mobile Satellite Systems.*



call control. For call establishment, the below decks display gives the operator a menu of all possible parameter choices, limiting the range to those which will ensure proper operation of the system. The entire control sequence has been designed to eliminate the operator's need for extensive training or manual reference.

"Designed-in diagnostics and fault isolation features, including fully connectorized modular components, ensure simplified, low-cost system maintenance," the spokesperson noted.

The MCS-9100 offers a wide variety of optional features and peripheral equipment. An emergency power supply, for instance, ensures communications for a full six hours in the event of a shipboard electrical failure. A remote terminal control unit is available to provide communications control from any location on board the vessel. Other options include a Satnav interface for automatic transmittal of information to a shore station, a personal computer interface, a PBX/PABX, a bridge annunciator, telephone expansion unit, weather facsimile information (WEFAX), and an automatic voice call initiation feature.

N O T E S

Continued from page 4

million in the third quarter of last year to $1.4 million in the year's third quarter. These reduced losses reflect the Corporation's previously announced decision to sell, subject to FCC approval, all of its partnership interest in **SBS** to the other partners. Although the sale has not yet been completed, the effective date of the sale has been set as of July 31, 1984. Accordingly, the Corporation has recognized its share of SBS losses incurred through July 31, 1984. It is anticipated that the sale will be completed and the gain will be recorded during the fourth quarter of 1984. The Corporation's share of SBS losses for the first seven months of 1984 totalled $9.8 million as compared to $17.0 million for the first nine months of last year.

Consolidated net income for the third quarter of 1984 was $12.8 million, virtually unchanged from the third quarter of 1983. Higher income from **Comsat**'s international satellite services and reduced losses relating to the Corporation's ownership interest in **SBS** were partially offset by the absence of a non-recurring gain resulting from the August 1983 sale of the Corporation's computer-aided engineering subsidiary, by previously anticipated reductions in revenues from the Corporation's Comstar and Marisat satellite systems and by increased losses from manufacturing operations.

Consolidated net income for the first nine months of 1984 was $36.8 million, or $2.04 per primary share, compared to $41.1 million, or $2.30 per primary share, from the first nine months of last year.

Intelsat celebrates 20th year with reception at new building

On Sunday, August 12, the International Telecommunications Satellite Organization (**Intelsat**) celebrated its 20th anniversary with a reception at its soon-to-be-opened new headquarters building at Van Ness and Connecticut Avenues in northwest Washington, D.C. Attending were representatives from more than 50 countries, Intelsat management, communications industry representatives, and U.S. Government officials. Richard Colino, Intelsat Director General, was host for the event, and he was joined—live via satellite—by Arthur C. Clarke, father of the communications satellite concept, from Sri Lanka. (See the coverage of Clarke in this issue, beginning on page 27.)

Commenting on **Intelsat**'s 20 years of successful service, **Comsat**'s Chairman and Chief Executive Office Dr. Joseph V. Charyk, issued the following statement: "For 20 years, **Intelsat** has dedicated itself to provide and expand satellite communications worldwide. The organization has been successful beyond anyone's expectations in developing a global commercial communications network accessible to people in more than 170 countries. Furthermore, the creation of the Intelsat system fulfilled the Congressional mandate which also established **Comsat** under the Communications Satellite Act of 1962 and has served to fully meet major national policy objectives of the United States.

"We at **Comsat** are proud to have participated in this achievement—both as the system's manager for many years and as the U.S. Signatory to the organization since its inception. We look forward to **Intelsat**'s continued success as it remains the major force today in promoting international communications for business and other uses."

Earlier in the year, President Ronald Reagan commented about **Intelsat**'s 20th anniversary. His statement reads:

"I am pleased to extend my congratulations and best wishes to **Intelsat**, the International Telecommunications Satellite Organization, on the 20th anniversary of its founding. Efficient communications fosters mutual understanding and, thus, contributes to global peace. Through **Intelsat**, nations with differing backgrounds have cooperated to build a common heritage founded on technological and commercial accomplishments unparalleled in world experience.

"The United States is pledged to maintaining the vitality of **Intelsat** in this era of new electronics communications services, diversifying demand, and increasing competition. We support continued universal availability of those basic and essential satellite communications services **Intelsat** provides in response to world needs.

"**Intelsat**'s record of real accomplishments places it in the forefront among international organizations. To your distinguished Director

Continued on next page

General, Richard Colino, the members of the Board of Governors, and all Intelsat Parties and Signatories, let me express the gratitude of the United States for a task well done."

Applications are filed for two new Digital Express locations

Comsat is planning the construction of a Teleport earth station in Houston, Texas, that will, if approved, become operational in 1985. An application to construct the earth station, which will offer the new Digital Express international business service, has been filed with the Federal Communications Commission (FCC).

The Comsat earth station will include an antenna and related electronic equipment to connect the Houston Teleport to points in Europe, Africa and South America through the Intelsat satellite system. It will have the capability to relay digital transmissions at rates of 56/64 kilobits per second to 1.5 megabits per second and higher for a variety of services, including digitized voice, data, computer-to-computer communications, and videoconferencing.

Commenting on the proposed earth station, Comsat President Irving Goldstein stated, "The Houston Teleport will be among the first telecommunications facilities of its type in the United States to provide international satellite transmissions. We plan to participate in this effort to increase the use of commercial international communications and to open doors which improve business opportunities for the Houston area."

In an effort to bring the benefits of the new Digital Express service to as large a user community as possible, **Comsat** has also filed an application with the FCC for approval to build and operate a 9-meter antenna at the Comsat headquarters building in southwest Washington, D.C.

If approved, the earth station will be operational in 1985 and will provide a connection point for Digital Express international digital business services with locations in the Atlantic region via the Intelsat satellite system.

Earlier, the FCC approved a Comsat application to build an earth station offering Digital Express communications services at the New York Teleport under construction on Staten Island.

Dr. Charyk named committee chairman, other officer news

Dr. Joseph V. Charyk, Chairman and Chief Executive Officer, has been named Chairman of the National Security Telecommunications Advisory Committee by President Ronald Reagan. The committee, which comprises leaders of the telecommunications industry, has been established in order to provide guidance to the President on the means to ensure the security of the nation's telecommunications capabilities.

William H. Berman, Senior Vice President and General Counsel, has retired. Mr. Berman's career at **Comsat** began in 1964, and he has been the General Counsel of the Corporation since 1974. In commenting on the retirement, Dr. Charyk stated, "Our deep appreciation goes to Bill Berman for the major role he has played in the successful growth of **Comsat** over the past 20 years. His dedication and commitment leave us with a strong base upon which to further build our business."

Mr. Berman has joined the Washington, D.C., law firm of Wiley, Johnson & Rein.

Assuming the duties of General Counsel for the Corporation is Willard R. Nichols. Mr. Nichols, formerly Chief of Staff to the Chairman of the Federal Communications Commission, Mark Fowler, has the title of Vice President and General Counsel.

Robert F. Allnutt has assumed the newly created position of Vice President, Government Affairs, with responsibility for the management and direction of **Comsat**'s liaison with the executive branch, the U.S. Congress and regulatory agencies. Mr. Allnutt was formerly Vice President and Legal Counsel of the U.S. Committee for Energy Awareness.

Joseph M. Quigley joins **Comsat** as Vice President, Management Information Systems, from The Continental Group, where since 1979 he served as General Manager for Information Services and Executive Vice President of CGI Telecommunications, Inc.

Francois Giorgio, formerly Vice President, Intelsat Engineering and Development, is now Vice President, Intelsat Technical Services, Comsat World Systems, replacing Louis Pollack, who

has retired. In his new position, Mr. Giorgio assumes responsibility for the management of Comsat's engineering and technical support to **Intelsat**.

Also at World Systems, Arnold Satterlee has been appointed to the newly created position of Vice President, Satellite Programs, and Assistant General Manager, Intelsat Technical Services. Mr. Satterlee was formerly Senior Director, Spacecraft Engineering, World Systems.

Carl A. Washenko becomes Vice President, Human Resources, Comsat Technology Products, Inc. (**CTP**). Mr. Washenko was formerly Vice President, Human Resources and Administration, Comsat TeleSystems, Inc. **TeleSystems** is a part of **CTP**.

Also within Comsat Technology Products, William E. Wilson becomes President of Amplica, Inc. Mr. Wilson was formerly Executive Vice President and General Manager.

Two senior positions have been filled at **TeleSystems**. Donald L. Bise, formerly Senior Vice President, ADC Magnetic Control Corporation, is President, and Nelson E. Boyd, formerly Vice President and General Manager, Integrated Office Systems, Northern Telecom, is Senior Vice President, Marketing.

At Environmental Research & Technology, Inc. (**ERT**), two promotions into the vice president ranks have taken place. Douglas M. Ross, who has directed ERT marketing and project management efforts in the western states for the past seven and one half years, is now Vice President. Thomas F. Lavery, who has considerable project management experience with **ERT** in the air resources area, is now Vice President, Air Resources Studies.

UN receives Intelsat capacity for peacekeeping and relief

Secretary General Javier Perez de Cuellar of the United Nations and Director General Richard R. Colino of **Intelsat** have signed an agreement that will provide satellite capacity from **Intelsat** for UN peace-keeping and emergency relief activities. Under the terms of the agreement, **Intelsat** will provide the capacity for a five-year period that began on September 8, 1984.

Speaking in his office after the signing, Secretary General Perez de Cuellar congratulated **Intelsat**: "For quite a number of years, the United Nations has been trying to establish satisfactory communications by satellite for its peacekeeping operations and its humanitarian activities, whether they be of an emergency nature or otherwise. I am also very pleased that you have found it possible to come to New York at a time when Intelsat is celebrating its 20th Anniversary. Your presence here symbolizes the contribution that **Intelsat** is making to international peace and understanding. I extend to you and your organization my sincere congratulations."

Director General Colino of **Intelsat** responded: "It is a pleasure for us to make this small contribution, which we view as a beginning to a close working relationship with the United Nations as **Intelsat** assists in meeting your telecommunications requirements as they expand. You can always count on **Intelsat** to provide the UN with assistance in every way possible."

TeleSystems TDMA units ordered by Western Union

Comsat TeleSystems, Inc., has been selected to provide eight Time-Division Multiple-Access (TDMA) terminals to Western Union Telegraph Company for use in its commercial satellite network. Under the terms of the agreement, **TeleSystems** will supply two reference stations, six local TDMA terminals, and an integrated monitor and control substation. The multi-million dollar contract calls for the equipment to be installed and operational by the end of 1984.

Western Union is installing the TDMA terminals to improve the flexibility and cost-effectiveness of its satellite system. Through extensive use of state-of-the-art microprocessor components and software techniques, **TeleSystems** provides a highly reliable TDMA system that is capable of establishing and, if necessary,

Continued on next page

rapidly changing network circuit interconnection. In addition, **TeleSystems'** TDMA further optimizes the efficient utilization of satellite transponders through "Transponder Hopping," a feature that increases the network bandwidth by connecting users over several transponders.

Comsat Laboratories to do ACTS ground segment work

Comsat has signed a contract with RCA-Astro-Electronics for the design and development of the ground segment of NASA's Advanced Communications Technology Satellite (ACTS) System. RCA is NASA's prime contractor for the ACTS Program, which will improve communications satellite technology utilizing the 20 and 30 gigahertz (GHz) or Ka frequency bands, which do not suffer from the overcrowding experienced at lower frequencies (i.e. C- and Ku-bands).

Comsat Laboratories, located in Clarksburg, Maryland, will develop and design the ground elements of the ACTS system. These include the primary and secondary earth stations as well as the Master Control Station at NASA Lewis Research Center in Cleveland, Ohio, which will have program management responsibility for this program. Once the ground stations are operational and the ACTS satellite is launched, Comsat General Corporation, a subsidiary of **Comsat**, will control the satellite communications and maintain the ground stations.

ACTS will also provide new and efficient frequency spectrum conservation techniques which are applicable not only to 20 and 30 gigahertz, but also to other portions of the frequency spectrum. These techniques include baseband processing (a high-speed digital switchboard in the sky for efficient message routing); multiple-beam scanning antenna (scanning spot beams that permit efficient coverage of the United States); communication trunk switching (a high-speed digital switch that switches high volume traffic trunks for efficient point-to-point communications); and Time-Division Multiple-Access (TDMA), an efficient technique that permits flexible and efficient utilization of the entire ground-space ACTS system capacity.

Two contracts from military involve live video technology

Comsat General Corporation has received two contracts from two different branches of the U.S. military. Both contracts involve aspects of the new live teletraining and videoconferencing technology.

For the Army School of the Air, a division of the Training and Doctrine Command (TRADOC), based in Fort Eustis, Virginia, **Comsat General** will create a point to multipoint video teleseminar system that will initially have one uplink site—at Fort Lee, Virginia—and 11 downlink sites. If the system were to expand, it could grow to as many as 21 uplink and 250 downlink sites. If all options are exercised the contract could be worth in excess of $15 million.

The contract calls for **Comsat General** to provide an end-to-end turnkey service including the design, provision, installation and maintenance of all electronics at all sites and the necessary satellite time. In addition, instruction on the use of the video medium will also be provided to military instructors at Fort Lee. The audience at receive sites will be able to question presenters at transmit sites via an audio system that **Comsat General** also will be responsible for making available.

The other contract calls for construction of a fully equipped video conferencing room at the Naval Underwater System Center (NUSC) in Newport, Rhode Island. The contract also contains options for two additional videoconferencing rooms, one in New London, Connecticut, the other at the Naval Sea Systems Command in Arlington, Virginia.

If all options are exercised, the contract with NUSC will be worth just under $3 million. Both the TRADOC and NUSC contracts call for the incorporation of systems to prevent the unauthorized receipt of transmissions.

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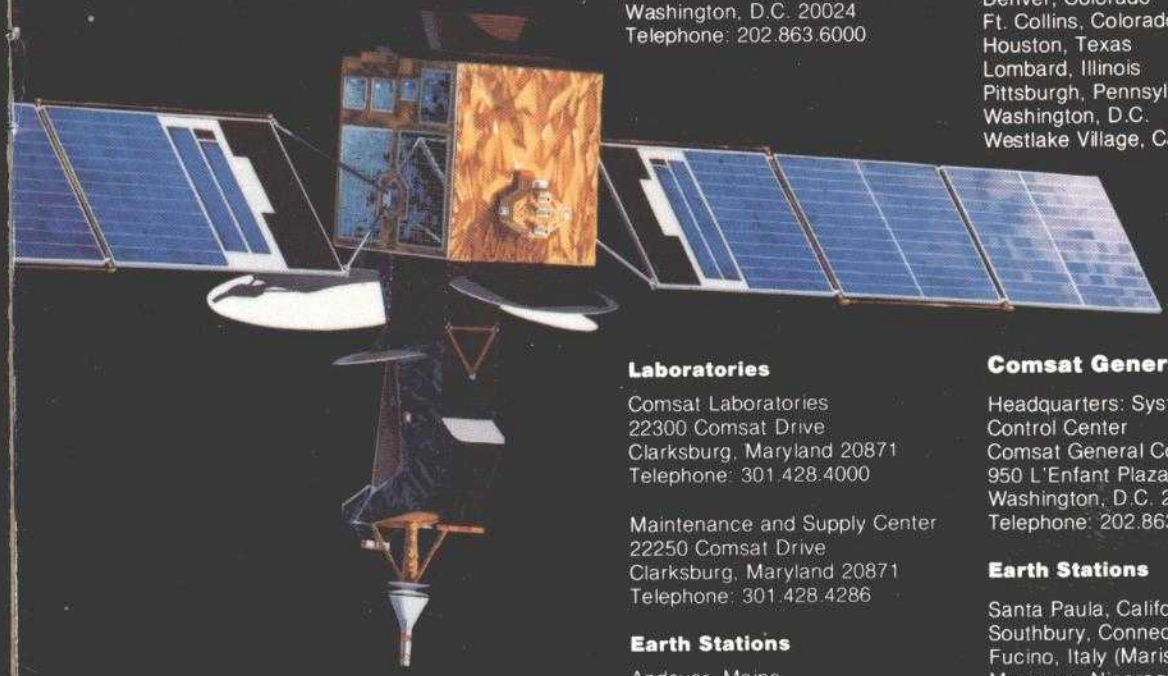
Ft. Collins, Colorado
Houston, Texas
Lombard, Illinois
Pittsburgh, Pennsylvania
Washington, D.C.
Westlake Village, California



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Maintenance and Supply Center
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Telephone: 301.428.4286

Earth Stations

Andover, Maine
Brewster, Washington
Ebeye, Rep. of Marshall Islands
Etam, West Virginia
Jamesburg, California
Kosrae, Fed. States of Micronesia
Majuro, Rep. of Marshall Islands
Pago Pago, American Samoa
Palau, Rep. of Palau
Paumalu, Hawaii
Ponape, Fed. States of Micronesia
Roaring Creek, Pennsylvania
Pulantat, Guam
Susupe, Northern Mariana Islands
Truk, Fed. States of Micronesia
Yap, Fed. States of Micronesia

Comsat General

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Earth Stations

Santa Paula, California
Southbury, Connecticut
Fucino, Italy (Marisat TTC)
Managua, Nicaragua (Nicatelsat)

Technology Products

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The Communications Satellite Corporation is a shareholder-owned corporation based in Washington, D.C. Comsat provides satellite-based communications services and products to international, maritime and domestic markets, consulting services, computer-aided engineering tools, and information and environmental services. Comsat has been designated by the U.S. Government as the U.S. participant in the International Telecommunications Satellite Organization (Intelsat) and the International Maritime Satellite Organization (Inmarsat).

COMSAT